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Research and Development in Industry: 1994

Funds, 1994
Scientists and Engineers,
January 1995

Detailed Statistical Tables

COMPLETED

Division of Science Resources Studies
Directorate for Social, Behavioral, and Economic Sciences
National Science Foundation
NSF 97-331

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Contributors

Data collection, preparation, and tabulations were performed by the Bureau of the Census, Department of Commerce, for the National Science Foundation. The Project Officer and Principal Author for this report was Raymond W. Wolfe.

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INTRODUCTION

This report is the second of two publications produced from results of the 1994 Survey of Industrial Research and Development. The first, a Data Brief announcing the availability of survey results, contains analytical information and highlights the decreased share of R&D supported by the Federal Government during 1994. This report, the Detailed Statistical Tables report, contains the full set of statistics produced from the survey. Both publications provide statistics on research and development (R&D) funding for the years 1984–94 and on R&D personnel for the period from January 1985 to January 1995. (Both printed publications also are available on the World Wide Web at *http://www.nsf.gov/sbe/srs/stats.htm.*)

This report provides national estimates of the expenditures on R&D performed within the United States by industrial firms, whether U.S. or foreign owned. Among the statistics are estimates of total R&D, the portion of the total financed by the Federal Government, and the portion financed by the companies themselves (or by other non-Federal sources such as State and local governments or other industrial firms under contracts or subcontracts). Total R&D is also separated into its character-of-work components: basic research, applied research, and development. Other statistics include R&D financed by a domestic firm but performed outside the United States, R&D contracted to organizations outside of the firm, and the funds spent to perform energy-related R&D. This report also provides statistics on domestic net sales, number of employees, number of R&D-performing scientists and engineers, and cost per R&D scientist and engineer.

The Survey of Industrial Research and Development is an annual sample survey that intends to include or represent all for-profit, nonfarm R&D-performing companies, either publicly or privately held. The survey's primary focus is on U.S. industry as a performer of, rather than as a source of funds for, R&D. Thus, data on Federal support of R&D activities performed by industry are collected and resulting statistics appear in several tables, but statistics on industrial funding of R&D undertaken at universities and colleges and other nonprofit organizations are not collected and therefore are not included in the tables.[1] The result of collecting and publishing performer-reported statistics is that the federally funded R&D performance totals presented in this report differ from the Federal R&D funding totals reported by the Federal agencies that provide the funds and published in National Science Foundation's (NSF's) *Federal Funds for Research and Development* report series. One reason for these differences is that performers of R&D often expend Federal funds in a year other than the one in which the Federal Government provides authorization, obligations, or outlays. (For definitions of these terms, see section C under Comparisons to Other Statistical Series.) During the past several years, the differences have widened between the Federal R&D funding reported by performers and that reported by funding agencies. These trends are documented and analyzed in *National Patterns of R&D Resources: 1996* (NSF 96-333).

Industry statistics in this report are developed from data collected from individual companies or enterprises. Since the survey is enterprise based rather than establishment based, all data collected for the various subparts of each enterprise (plants, divisions, or subdivisions) are tabulated in the major standard industrial classification (SIC) of the company. The resulting industry estimates are reported using the SIC of the companies within each industry. National totals are estimated by summing the industry estimates.

All companies that spend more than $1 million annually on R&D in the United States or have 1,000 or more employees receive a survey questionnaire every year. These attributes are determined using information from previous surveys or other sources. Remaining firms are subjected to probability sampling and may or may not receive a questionnaire for a given survey year. Among the organizations purposely excluded from the survey are trade associations and not-for-profit consortia. Although their primary mission is to serve industry, these associations are established as nonprofit organizations.

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[1] Data on R&D performed at universities and colleges are collected in the annual Survey of Scientific and Engineering Expenditures at Universities and Colleges. Resumption of a survey of other nonprofit organizations, discontinued in the mid-1970s, is underway. More information about these surveys is available from NSF's Research and Development Statistics Program in the Division of Science Resources Studies at the address given at the end of this introduction.

Respondents receive detailed definitions to help them determine which expenses to include or exclude from the R&D data they provide. Nevertheless, the statistics presented in this report are subject to response and concept errors caused by different respondent interpretations of the definitions of R&D activities and by variations in company accounting procedures.

The National Science Foundation's (NSF) Division of Science Resources Studies has sponsored and managed a survey of industrial R&D since 1953. The 1953–56 surveys were conducted by the Bureau of Labor Statistics (BLS), U.S. Department of Labor.[2] Since 1957, the Bureau of the Census, U.S. Department of Commerce, has conducted the survey.[3] Census staff conduct the survey under Title 13 of the United States Code, which prohibits publication or release of data or statistics that may reveal information about individual companies. Therefore, in some tables of this report the symbol "(D)" is used as a footnote reference to indicate that estimates are being withheld to avoid possible disclosure of information about operations of individual companies.

The content of the survey has been expanded and refined over the years in response to an increasing need by policymakers for more detailed information on the Nation's R&D effort. For example, questions on energy R&D were added in the early seventies, following the first oil-shortage crisis. On the other hand, the frequency of collection of certain data items has been reduced in recent years in an attempt to alleviate some of the respondent burden that has been placed on industry from all sources. For large firms known to perform R&D, a detailed questionnaire, Form RD-1L, is used to collect data for odd-numbered years and an abbreviated version, Form RD-1S, is used to collect data for even-numbered years. To further limit reporting burden on small R&D performers and on firms that are included in the sample for the first time, an even more abbreviated form, Form RD-1A, which collects only the most crucial data, is used each year. This report provides data collected from the Forms RD-1S and RD-1A.

Several changes have been made to the survey recently that are of special importance to users of this report. Prior to the 1992 survey, statistics were based on samples selected at irregular intervals (i.e., 1967, 1971, 1976, 1981, 1987). In intervening years a subset of the last sample (called a panel) was used. The most recent sample prior to the 1992 survey was selected and first used for survey year 1987. Original estimates for 1988 through 1991 were based on surveys of approximately 1,700 panel companies that reported R&D activity in the 1987 survey. Beginning with the 1992 survey, statistics are based on samples selected annually. Also, beginning with the 1992 survey, the sample size was increased from approximately 14,000 to nearly 23,400 firms. This increase was made for several reasons: (1) to account better for births of R&D-performing establishments in the survey universe, (2) to more fully and accurately survey R&D performed by nonmanufacturing firms, especially in the service sector, and (3) to gather more current information about potential R&D performers.

An analytical overview of the statistics developed from the survey data follows immediately. Tables containing the statistics are provided in section A. Detailed information about the history of the survey, survey methodology, comparability of the statistics, survey definitions, and other technical notes are provided in section B. Survey questionnaires, instructions, and other survey documents are reproduced in section C. Specific questions regarding the survey may be directed to Raymond Wolfe at (703) 306-1772, via e-mail at rwolfe@nsf.gov (Internet), or at the following mailing address:

Research and Development Statistics Program
Division of Science Resources Studies
National Science Foundation
4201 Wilson Boulevard, Suite 965
Arlington, VA 22230

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[2] See National Science Foundation, *Science and Engineering in American Industry: Final Report on a 1953-54 Survey* (NSF 56-16) and *Science and Engineering in American Industry: 1956* (NSF 59-50) (Washington, DC: Supt. of Documents, GPO, 1956 and 1960).

[3] Data obtained in the earlier BLS surveys are not directly comparable with Census figures because of methodological and other differences.

ANALYTICAL OVERVIEW

During 1994 the amount spent by companies in the U.S. on investigations for the advancement of science or to achieve commercial goals (basic and applied research) and activities aimed at translating results of these investigations into products or processes (development) amounted to $119.6 billion, 2 percent more than during 1993. However, after adjusting for inflation, the amount spent for industrial R&D during 1994 decreased 0.2 percent, having declined by 3.5 percent in constant dollars in 1993. This downward trend is only the second since 1953. The first occurred in the early 1970s when total R&D measured in constant dollars began falling and did not regain its 1969 level until 1978.

Eighty-one percent of total R&D performed during 1994 was financed by companies' own funds and 19 percent was financed by the Federal Government through contracts and grants, including the two percent of total R&D performed by Federally Funded Research and Development Centers (FFRDC) administered by industry. Company funding continued to increase, from $94.6 billion to $97.1 billion, as it has each year since 1953. Federal funding decreased from $22.8 billion to $22.5 billion, continuing a downward trend that began in 1988. After adjusting for inflation, the directions of these changes are the same: company-funded R&D rose 0.6 percent and Federally funded R&D fell 3.5 percent.

The share of R&D performed by firms in the nonmanufacturing industries decreased from 26 percent during 1993 to 24 percent, while manufacturers performed the remaining 76 percent. The remainder of this section will focus on the levels and trends of R&D performed by these two groups, with emphasis on the manufacturing industries. Beginning with the 1995 survey, more detailed statistics for the nonmanufacturing industries will be available. Instead of grouping all nonmanufacturing industries together, as has been done in this and in previous publications, about a dozen subgroups will be added to the 1995 tabulations.

SOURCES OF R&D FUNDS

FEDERAL SUPPORT

Among manufacturing industries, Federal funding accounted for $17.3 billion of total R&D with most of that amount, $8.8 billion, spent on research performed by companies that manufactured aircraft and missiles for the Department of Defense and the National Aeronautics and Space Administration. Although down 6 percent from 1993 levels, these firms received 39 percent of the Government's support of industrial R&D. Makers of professional and scientific instruments and of electrical equipment ranked second and third. Firms in those industries performed $3 billion and $2 billion of Federal R&D, respectively, and accounted for 23 percent of total Federal R&D. Manufacturers of machinery including computers, petroleum extractors and refiners, drug and medicine makers, and other manufacturers received 15 percent of Federal funding and performed $3 billion of the total Federal R&D.

Firms in nonmanufacturing industries as a group received $5 billion, a 23-percent share of total Federal support. Most of this support went to computer-related service firms and research, development, and testing firms.

COMPANY SUPPORT

While the Federal government's share of support of R&D to most industry groups declined during 1994, the amount firms contributed to their own R&D efforts continued to grow. Manufacturing industries as a group spent $73 billion on R&D. Among the manufacturing industries, firms in transportation equipment, especially automobile makers, performed the largest amount of R&D during 1994, $18 billion, with chemical manufacturers including makers of drugs and medicines ranking a close second, $17 billion. Manufacturers of electrical equipment, including electronic and communication components, performed $14 billion of R&D. Together these three industry groups accounted for two-thirds of total company-funded R&D performed by manufacturers. Makers of professional and scientific instruments, machinery, petroleum extractors and refiners, and other manufacturers performed the rest. Nonmanufacturing firms as a group spent $24 billion on company-funded R&D during 1994. Among nonmanufacturing performers, the largest were computer-related service firms, which spent $6 billion, and research, development, and testing firms, which spent $2 billion.

CHARACTER OF WORK

MANUFACTURING INDUSTRIES

Chart 1 shows how total industrial R&D was distributed among its character of work components (basic research, applied research, and development) for manufacturing firms.

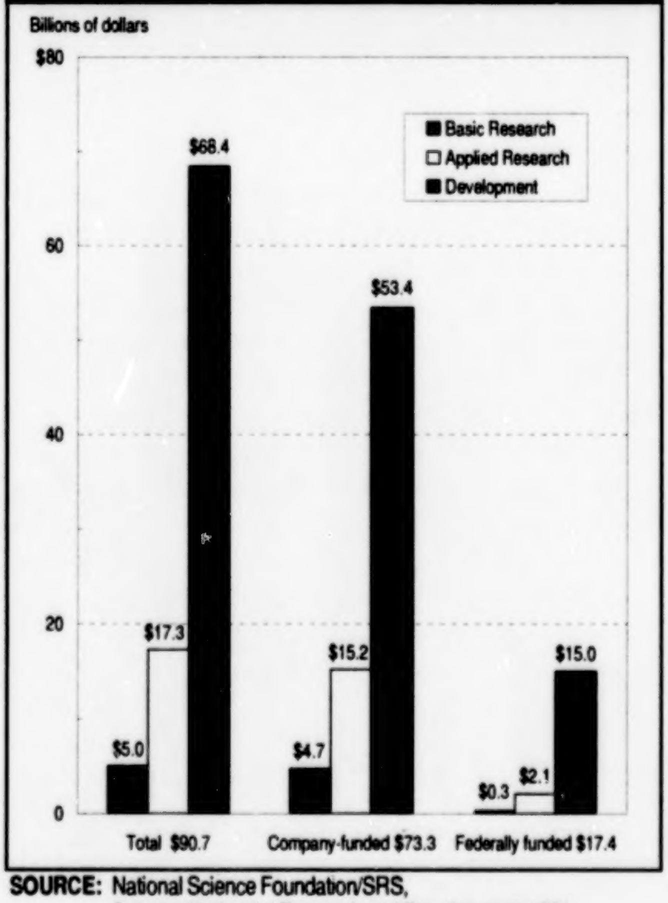
RESEARCH

Half of company-funded basic research performed by U.S. industry was performed by companies in the chemical and allied products classification ($3 billion). This group includes drug and medicine manufacturers for whom original experimentation is crucial for the discovery of new cures and pain killing compounds. About twelve percent ($0.1 billion) of Federally funded basic research performed in the U.S. was performed by manufacturers of transportation equipment, including aircraft and missiles. Among the large performers of company-funded applied research were manufacturers of drugs and medicines ($3 billion), professional and scientific instruments ($1 billion), and electronic components ($1 billion). About one-third ($0.8 billion) of Federally funded applied research was performed by manufacturers of transportation equipment.

DEVELOPMENT

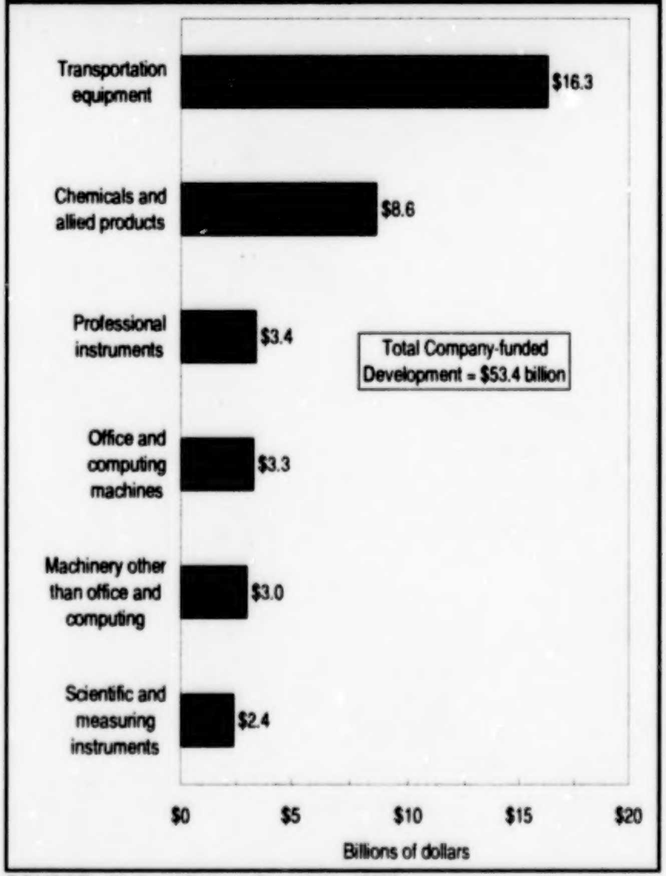
The point of most industrial R&D is to develop and market new goods and services. Chart 2 shows the major industry groups engaged in non-routine, company-funded technical activities aimed toward the development of commercial products or processes.

Chart 1. Total industrial R&D distribution by character of work in manufacturing industries, 1994



SOURCE: National Science Foundation/SRS,
Survey of Industrial Research and Development: 1994

Chart 2. Company-funded development performed by manufacturing industries, 1994



SOURCE: National Science Foundation/SRS,
Survey of Industrial Research and Development: 1994

NONMANUFACTURING INDUSTRIES

Chart 3 shows how total R&D was distributed among its character of work components (basic research, applied research, and development) for firms in the nonmanufacturing industries:

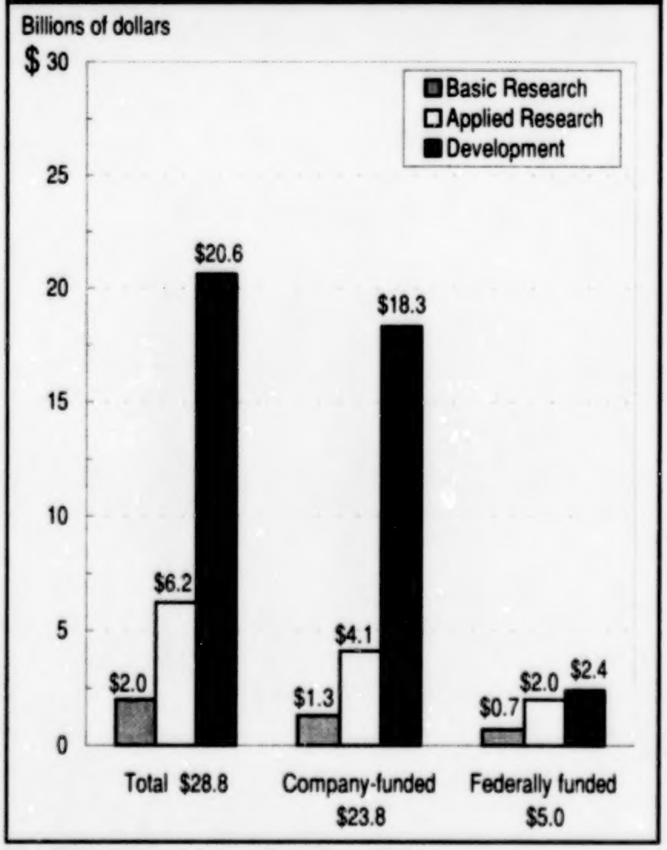
"OUTSIDE" R&D

In addition to collecting information on R&D performed by companies themselves, the survey collects information on R&D contracted out to other performers in the U.S. and on R&D performed outside of the U.S. by subsidiaries and foreign affiliates.

CONTRACTED R&D

About 12 percent of manufacturers and 10 percent of companies in nonmanufacturing industries contracted R&D to entities outside the company. On average these groups contracted out 2.7 percent and 4.0 percent of their total R&D performance, respectively. Entities that received the contracts included other industrial firms, commercial laboratories, consultants, educational institutions, and hospitals. Table 1 gives the amounts of contracted R&D financed by companies in major R&D-performing industry groups and indicates the percentage of company-funded R&D that was contracted out. Industries are arrayed beginning with those that contracted out the largest amount of R&D to those that contracted out the smallest amount of R&D.

Chart 3. Total industrial R&D distribution by character of work in nonmanufacturing industries, 1994



SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

FOREIGN R&D

On average, 8.0 percent of R&D performed by manufacturers and 4.9 percent of total R&D performed by firms in the nonmanufacturing industries was performed abroad. Table 2 gives industry levels of R&D (from highest to lowest) financed by U.S. companies but performed outside their domestic operations by subsidiaries in foreign countries, including Canada and Puerto Rico, and indicates the percentage of company-funded R&D that was performed abroad.

Table 1. Company-funded R&D contracted to outside organizations and the percentage of total company-funded R&D contracted out, by industry: 1994

	Company-funded contracted R&D	Percentage of total company-funded R&D contracted out
	[Dollars in billions]	[Percent]
Total	3.6	3.7
Nonmanufacturing industries	1.2	4.9
Drugs and medicines	1.1	11.0
Transportation equipment	0.6	3.3
Machinery	0.2	2.5
Electrical equipment	0.1	0.9
All other industries	0.5	1.7

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table 2. Company-funded R&D performed abroad and the percentage of total foreign and domestic company-funded R&D performed abroad, by industry: 1994

	Company-funded foreign R&D	Percentage of total foreign and domestic company-funded R&D performed abroad
	[Dollars in billions]	[Percent]
Total	9.4	8.8
Drugs and Medicines	1.5	13.8
Nonmanufacturing industries	1.5	5.9
Industrial chemicals and chemicals other than drugs	0.9	11.7
Professional and scientific instruments	0.9	10.0
Electrical equipment	0.5	3.5
All other industries	4.0	10.3

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Included in the "all other industries" category are manufacturers of motor vehicles and other transportation equipment. Subsidiaries and affiliates of companies in this group financed $2.1 billion of foreign R&D during 1991 (statistics for 1992-94 have been suppressed and are not available because of disclosure[4]) and it is assumed that this industry group also ranked first among the manufacturing industries that financed foreign R&D during 1994.

Characteristics of R&D Performers

R&D and Firm Size

Performance of R&D by the smallest firms, those with less than five hundred employees, declined 4 percent during 1994 compared with 1993. For this group, Federally sponsored R&D declined 28 percent. For larger firms, those with between 500 and 5,000 employees, total R&D increased 10 percent and Federal R&D declined 2 percent. For the largest firms, those with 5,000 or more employees, company-funded R&D increased 2 percent and Federal R&D increased 1 percent. These year-to-year comparisons represent changes in the amounts and character of R&D performed as well as shifts in the size categories of the firms.

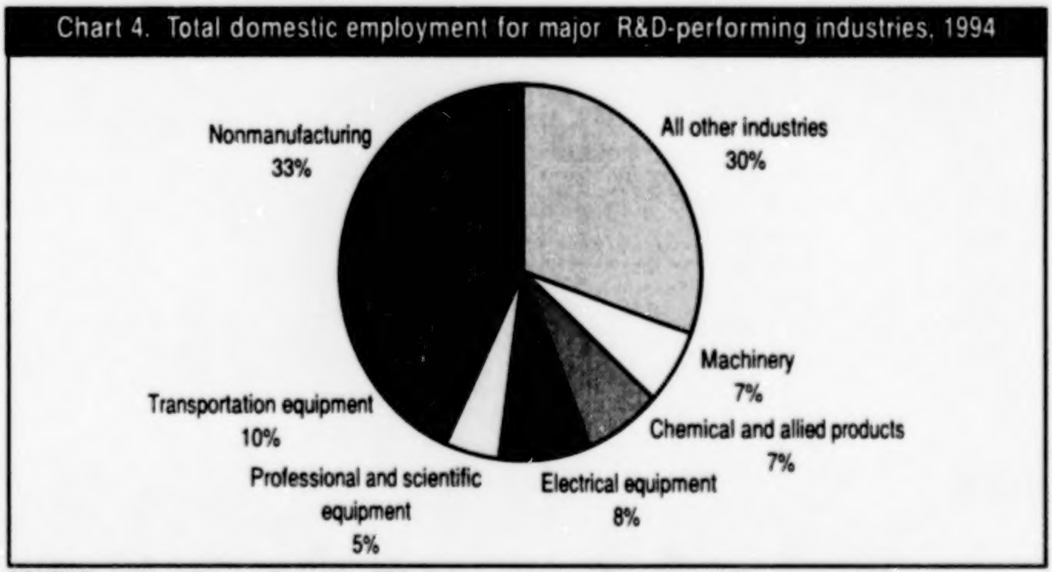
R&D as a Percent of Net Sales

Among manufacturing firms, R&D performers reported domestic operations sales of $2.5 trillion during 1994.[5] On average, these firms spent 4 percent of net sales on R&D during 1994. The smallest firms, those with fewer than 500 employees, spent 3 percent; the largest firms, those with 25,000 or more employees, spent 5 percent; and the firms in the categories between those two groups spent from 2.2 to 2.7 percent. The four manufacturers with the largest R&D programs collectively spent 6 percent of sales on R&D; the next four companies spent 17 percent, and the next twelve spent 9 percent. The three industry groups that spent the largest percentage of net sales on R&D were aircraft and missiles (14 percent), drugs and medicines (10 percent), and scientific instruments (11 percent). R&D-performing firms in the nonmanufacturing industries reported domestic operations sales of $1.1 trillion and spent an average of 3 percent of net sales on R&D.

Employment by R&D-Performing Firms

In addition to collecting information on the amount of R&D, the Survey of Industrial Research and Development also gathers information on the number of scientists and engineers who perform R&D. Of the 12 million people employed in the U.S. by manufacturers that performed R&D, the number of full-time equivalent (FTE) R&D scientists and engineers (those assigned full-time plus a prorated number of employees working part-time on R&D) was 571,100. R&D-performing firms in the nonmanufacturing industries employed 6 million people, 197,400 of whom were FTE R&D scientists and engineers. Compared with 1993, employment of FTE scientists and engineers rose 0.5 percent for both manufacturing and nonmanufacturing industries. Charts 4 and 5 show total

Chart 4. Total domestic employment for major R&D-performing industries, 1994



SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

domestic employment and the number of FTE R&D scientists and engineers for the industry groups that were major employers of R&D scientists and engineers during 1994.

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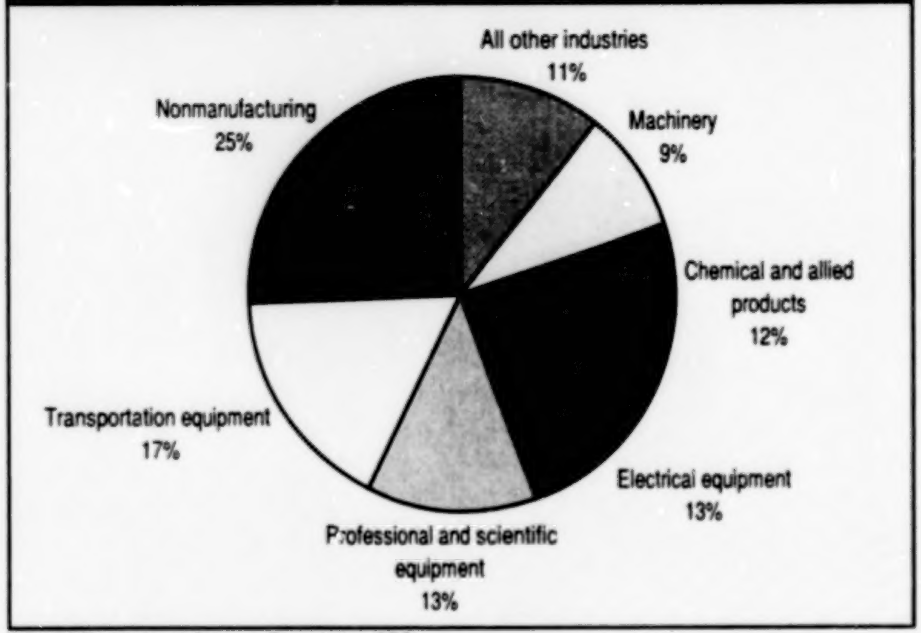
[4] See the table notes in section A for a detailed discussion of suppression of statistics.

[5] Sales are net value f.o.b. plant after discount and allowances, freight charges, and excise taxes.

The ratios of the number of R&D scientists and engineers to total employment are given in table 3 for each industrial group. Industries are arrayed beginning with those that employed the highest number of FTE R&D scientists and engineers to industries that employed the smallest number of R&D scientists and engineers.

Chart 5. Number of R&D scientists and engineers employed in major R&D-performing industries, 1994



SOURCE: National Science Foundation/SRS,
Survey of Industrial Research and Development: 1994

Table 3. Ratios of the number of R&D scientists and engineers to total employment

	Number of FTE R&D Scientists and Engineers	Total Domestic Employment	Ratio of R&D S&E's to Total Domestic Employment
	[In thousands]		[Percent]
Total	768.5	17,443.0	4.40
Nonmanufacturing industries	197.4	5,765.0	3.42
Transportation equipment	129.6	1,812.0	7.15
Professional/scientific instruments	100.6	791.0	12.72
Electrical equipment	96.5	1,433.0	6.73
Chemical and allied products	93.1	1,225.0	7.60
Machinery	70.4	1,143.0	6.16
All other industries	80.9	5,274.0	1.53

SOURCE: National Science Foundation/SRS,
Survey of Industrial Research and Development: 1994

NOTE TO USERS OF HISTORICAL STATISTICS

To obtain accurate historical statistics for 1984–92, use only the detailed statistical tables in this report and not those published earlier. Current-year (1994) and immediate prior-year (1993) statistics in trend tables were derived from the most recently completed survey cycle. Data for previous years were reviewed for consistency with current-year responses and may have been revised. Consequently, this report contains the latest revised statistics from the Survey of Industrial Research and Development for 1984–94.

Note particularly that, as a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes in section B for more information.

SECTION A. DETAILED STATISTICAL TABLES

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TABLE NOTES

CLASSIFICATION OF REPORTING UNITS

The basic reporting unit was the company or enterprise, which includes all establishments under common ownership or control. All research and development (R&D) expenditures and all scientists and engineers of each company were classified into a single standard industrial classification (SIC) code and size category.

COMPANY SIZE-CLASS

Companies are categorized by their total number of domestic employees. The following are the six company size-classes used in this report:

1. Fewer than 500 employees
2. 500 to 999 employees
3. 1,000 to 4,999 employees
4. 5,000 to 9,999 employees
5. 10,000 to 24,999 employees
6. 25,000 or more employees

CURRENT AND CONSTANT DOLLARS

Statistics in all tables are reported in terms of current dollars. Constant dollars are also presented in two summary trend tables, tables A-1 and A-22.

DISCLOSURE AND SUPPRESSION OF STATISTICS

The Bureau of the Census conducts the survey under Title 13 of the United States Code, which prohibits publication or release of data or statistics that may reveal information about individual companies. Therefore, the data in some of the table cells may have been deleted and replaced with "(D)". This occurs when a small number of companies account for a large percentage of the R&D funds or scientists and engineers in a particular data cell. Although publication of certain cells may be withheld, the estimates in the cells are always included in totals. The tables most often affected by this rule are those that contain data on Federal support to companies for R&D performance.

GEOGRAPHIC STATISTICS

The statistics cover only those operations located in the 50 states and the District of Columbia. Company-sponsored R&D performed outside the United States by foreign subsidiaries of U.S. domestic companies is included in table A-11 but is excluded from all other tables.

IMPUTATION

Missing data are imputed for some data items. Therefore, the statistics in some of the table cells may be accompanied by the notation "(S)" which indicates that the imputation rate–the percentage of the statistic not reported by respondents and consequently estimated–exceeds 50 percent for that item. In such cases the user should be aware that the estimate may be statistically unreliable. See table B-4 in section B for imputation rates for specific items.

INDUSTRY CLASSIFICATION

An enterprise or company level SIC code was assigned to each company. A single SIC code was assigned to multiestablishment companies based on the code that represented the most dominant aggregated activity for that firm in terms of total payroll. Statistics for the following industry groupings are published in this report (SIC codes are shown in parentheses[1]):

Food, kindred, and tobacco products (20,21)[2]
Textiles and apparel (22,23)
Lumber, wood products, and furniture (24,25)
Paper and allied products (26)

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[1] When the 1994 sample was drawn, the 1987 revision of the SIC system was in effect.

[2] Until 1984, the tobacco products industry (SIC 21) was included with "other manufacturing industries."

Chemicals and allied products (28)
  Industrial chemicals (281–82,286)
  Drugs and medicines (283)
  Other chemicals (284–85,287–89)
Petroleum refining and extraction (13,29)
Rubber products (30)
Stone, clay, and glass products (32)
Primary metals (33)
  Ferrous metals and products (331–32, 3398–99)
  Nonferrous metals and products (333–36)
Fabricated metal products (34)
Machinery (35)
  Office, computing, and accounting machines (357)
  Other machinery, except electrical (351–56, 358–59)
Electrical equipment (36)
  Radio and TV receiving equipment (365)
  Communication equipment (366)
  Electronic components (367)
  Other electrical equipment (361–64,369)
Transportation equipment (37)
  Motor vehicles and motor vehicles equipment (371)
  Other transportation equipment (373–75,379)
  Aircraft and missiles (372,376)[3]
Professional and scientific instruments (38)
  Scientific and mechanical measuring instruments (381–82)
  Optical, surgical, photographic, and other instruments (384–87)
Other manufacturing industries—printing and publishing (27), leather products (31), and miscellaneous manufacturing industries (39)
Nonmanufacturing industries—agricultural services, forestry, fishing and hunting (07–09); mining (10,12–14); construction (15–17); transportation, communications, electric, gas, and sanitary services (40–42,44–49); wholesale and retail trade (50–59); finance, insurance, and real estate (60–65); holding and other investment offices (67); hotels and motels (701); business services (73); automotive repair, services, and parking and miscellaneous repair services (75–76); motion pictures and amusement and recreation services (78–79); health and legal services (80–81); social services (83); museums, art galleries, and botanical and zoological gardens (84); engineering, accounting, research, management, and related services (87); and miscellaneous services (89).

PERCENTAGES

Percentages were calculated on the basis of thousands of dollars and may differ from those calculated using the rounded figures shown.

ROUNDING

Because of rounding, detail may not add to totals.

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[3] Because of the close similarity of their R&D activities, companies primarily engaged in the manufacture of ordnance and accessories, including complete guided missiles, are grouped with companies primarily engaged in the manufacture of aircraft and parts.

LIST OF TABLES

This is a comprehensive list of all tables in this publication. The list includes the detailed statistical tables in section A and the technical tables in section B.

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Table A-1. Trends in industrial R&D performance, by source of funds, in current and constant dollars: 1953–94 and preliminary estimates for 1995–96

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Year	Total R&D		Federal		Company 1/	
	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars
	[Dollars in millions]					
1953	$3,630	$16,500	$1,430	$6,500	$2,200	$10,000
1954	4,070	18,333	1,750	7,883	2,320	10,450
1955	4,640	19,414	2,180	9,121	2,460	10,293
1956	6,605	27,987	3,328	14,102	3,277	13,886
1957	7,731	31,684	4,335	17,766	3,396	13,918
1958	8,389	33,691	4,759	19,112	3,630	14,578
1959	9,618	37,570	5,635	22,012	3,983	15,559
1960	10,509	40,419	6,081	23,388	4,428	17,031
1961	10,908	41,475	6,240	23,726	4,668	17,749
1962	11,464	42,617	6,434	23,918	5,029	18,695
1963	12,630	46,434	7,270	26,728	5,360	19,706
1964	13,512	48,780	7,720	27,870	5,792	20,910
1965	14,185	49,947	7,740	27,254	6,445	22,694
1966	15,548	52,884	8,332	28,340	7,216	24,544
1967	16,385	54,076	8,365	27,607	8,020	26,469
1968	17,429	54,808	8,560	26,918	8,869	27,890
1969	18,308	54,814	8,451	25,302	9,857	29,512
1970	18,067	51,327	7,779	22,099	10,288	29,227
1971	18,320	49,380	7,666	20,663	10,654	28,717
1972	19,552	50,392	8,017	20,662	11,535	29,729
1973	21,249	51,450	8,145	19,722	13,104	31,729
1974	22,887	50,973	8,220	18,307	14,667	32,666
1975	24,187	49,161	8,605	17,490	15,582	31,671
1976	26,997	51,620	9,561	18,281	17,436	33,338
1977	29,825	53,354	10,485	18,757	19,340	34,597
1978	33,304	55,231	11,189	18,556	22,115	36,675
1979	38,226	58,271	12,518	19,082	25,708	39,189
1980	44,505	62,071	14,029	19,566	30,476	42,505
1981	51,810	65,665	16,382	20,763	35,428	44,902
1982	58,650	69,988	18,545	22,130	40,105	47,858
1983	65,268	74,849	20,680	23,716	44,588	51,133
1984	74,800	82,198	23,396	25,710	51,404	56,488
1985	84,239	89,236	27,196	28,809	57,043	60,427
1986	87,823	90,633	27,891	28,783	59,932	61,849
1987	92,155	92,155	30,752	30,752	61,403	61,403
1988	97,015	93,373	30,343	29,204	66,672	64,169
1989	102,055	94,060	28,554	26,317	73,501	67,743
1990	109,727	96,846	28,125	24,823	81,602	72,023

See explanatory information and SOURCE at end of table.

Table A-1. Trends in industrial R&D performance, by source of funds, in current and constant dollars: 1953–94 and preliminary estimates for 1995–96

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Year	Total R&D		Federal		Company 1/	
	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars
	[Dollars in millions]					
1991	$116,952	$99,449	$26,372	$22,425	$90,580	$77,024
1992	119,110	98,519	24,722	20,448	94,388	78,071
1993	117,400	95,061	22,809	18,469	94,591	76,592
1994	119,595	94,841	22,463	17,814	97,131	77,027
1995 (preliminary)	121,000	94,384	22,500	17,551	98,500	76,833
1996 (preliminary)	125,300	95,649	22,300	17,023	103,000	78,626

1/ Company funds include funds for industrial R&D work performed within company facilities from all sources except the Federal Government. The funds may be the companies' own or from outside organizations such as research institutions, universities and colleges, nonprofit organizations, other companies, and state governments. Company-financed R&D not performed within the company is excluded.

NOTES: 1987 gross domestic product implicit price deflators were used to convert current dollars to constant dollars.

As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-2. Summary data for R&D-performing companies in selected manufacturing and detailed nonmanufacturing industries: 1993–94

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Industry	SIC code	Research and development funds						Domestic net sales		R&D scientists & engineers		Domestic employment	
		Total		Federal		Company				January 1/		March	
		1993	1994	1993	1994	1993	1994	1993	1994	1994	1995	1993	1994
		[Dollars in millions]								[In thousands]			
Total		$117,400	$119,595	$22,809	$22,463	$94,591	$97,131	$3,208,865	$3,595,278	768.5	749.2	16,585	17,443
Food and kindred products	20	1,305	(D)	0	0	1,305	(D)	283,417	286,050	10.0	(D)	1,066	1,056
Tobacco products	21	40	(D)	0	0	40	(D)	5,093	16,478	0.2	(D)	16	47
Textile mill products	22	(D)	(D)	(D)	(D)	220	242	41,205	39,611	2.4	2.2	359	349
Apparel	23	(D)	(D)	(D)	(D)	66	74	9,997	10,673	0.8	0.9	104	97
Lumber and wood products, except furniture	24	40	46	0	0	40	46	10,796	12,740	1.2	0.5	83	84
Furniture and fixtures	25	(D)	(D)	(D)	(D)	155	155	19,066	19,454	2.2	1.8	217	253
Paper and allied products	26	(D)	(D)	(D)	(D)	1,191	1,263	110,244	130,358	10.6	10.6	562	696
Printing, publishing, and allied industries	27	308	318	0	0	308	318	36,289	48,022	10.0	3.5	303	367
Chemicals and allied products	28	(D)	(D)	(D)	(D)	16,658	16,559	278,581	322,039	93.1	91.5	1,196	1,225
Petroleum refining and extraction	13,29	2,152	1,950	14	10	2,138	1,939	238,345	235,280	9.7	9.0	385	376
Rubber products	30	(D)	(D)	(D)	(D)	1,059	1,432	51,422	62,223	9.0	8.8	378	456
Leather and leather products	31	(D)	40	(D)	0	23	40	2,782	7,089	0.2	0.3	23	46
Stone, clay, and glass products	32	538	591	9	38	529	553	35,168	35,778	4.0	4.3	245	221
Primary metals	33	669	690	23	17	646	672	94,448	116,624	5.1	6.7	452	482
Fabricated metal products	34	1,158	1,111	222	243	936	868	83,266	91,075	10.2	9.5	604	612
Machinery	35	8,381	8,110	86	99	8,295	8,011	182,978	210,835	70.4	66.3	1,145	1,143
Electrical equipment	36	13,349	15,338	1,667	1,801	11,682	13,537	215,494	259,693	96.5	105.5	1,267	1,433
Transportation	37	27,258	28,087	10,617	10,392	16,640	17,695	426,245	477,508	129.6	115.8	1,830	1,812
Professional and scientific instruments	38	10,119	11,441	2,577	3,384	7,542	8,058	104,694	124,541	100.6 (S)	90.6 (S)	738	791
Miscellaneous manufacturing industries	39	(D)	(D)	(D)	(D)	427	438	21,454	17,698	5.3	3.9	167	131
Communication services	48	(D)	(D)	(D)	(D)	4,320	4,177	182,339	200,993	29.5	30.1	917	884
Electric, gas, and sanitary services	49	342	403	46	82	295	321	185,580	187,791	1.6	1.9	566	565

See explanatory Information and SOURCE at end of table.

Table A-2. Summary data for R&D-performing companies in selected manufacturing and detailed nonmanufacturing industries: 1993–94

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Industry	SIC code	Research and development funds						Domestic net sales		R&D scientists & engineers		Domestic employment	
		Total		Federal		Company				January 1/		March	
		1993	1994	1993	1994	1993	1994	1993	1994	1994	1995	1993	1994
		[Dollars in millions]								[In thousands]			
Computer programming, data processing, other computer-related engineering, architectural, and surveying services	737,871	$10,092	$7,929	$2,367	$1,470	$7,725	$6,459	$49,578	$79,545	73	77	427	641
Hospitals and medical and dental laboratories	806–07	(D)	(D)	(D)	(D)	60	342 (S)	2,557	6,071	0.5	1.7 (S)	34	45 (S)
Research, development, and testing services	873	2,541	3,765	1,141	1,972	1,400	1,794	4,544	6,855	22.0	28.0	82	65
Other nonmanufacturing industries	07–10, 12–17, 40–42, 44–47 50–59, 60–65, 67, 701, 73 (except 737), 75–76 78–79, 80–81 (except 806 and 807), 83–84, 87 (except 871 and 873), 89	12,215	10,951	1,325	288	10,890	10,663	533,285	590,257	70.6	70.4	3,423	3,565

1/ Data recorded in January represent employment figures for the previous year.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-3. Total (company. Federal. and other) funds for industrial R&D performance. by industry and size of company: 1984–94

Page 1 of 2

Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
		[Dollars in millions]										
Total		$74,800	$84,239	$87,823	$92,155	$97,015	$102,055	$109,727	$116,952	$119,110	$117,400	$119,595
Distribution by industry:												
Food, kindred, and tobacco products	20,21	(D)	(D)	(D)	1,206	(D)	(D)	(D)	1,277	1,386	1,345	1,476
Textiles and apparel	22,23	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Lumber, wood products, and furniture	24,25	143	147	144	137	(D)	192	216	(D)	(D)	(D)	(D)
Paper and allied products	26	(D)	(D)	(D)	(D)	(D)	879	1,059	(D)	(D)	(D)	(D)
Chemicals and allied products	28	7,927	8,540	8,843	9,635	11,067	12,069	13,291	14,648	15,381	(D)	(D)
Industrial chemicals	281–82,286	3,240	3,498	3,552	3,716	4,172	4,451	5,010	5,390	5,165	(D)	(D)
Drugs and medicines	283	(D)	(D)	3,658	(D)	4,906	(D)	(D)	(D)	7,944	9,146	9,633
Other chemicals	284–85,287–89	(D)	(D)	1,633	(D)	1,989	(D)	(D)	(D)	2,272	(D)	(D)
Petroleum refining and extraction	13,29	(D)	(D)	(D)	1,897	1,997	2,180	2,306	2,498	2,277	2,152	1,950
Rubber products	30	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Stone, clay, and glass products	32	(D)	(D)	950	995	(D)	(D)	(D)	(D)	(D)	538	591
Primary metals	33	(D)	(D)	(D)	730	637	686	739	714	522	669	690
Ferrous metals and products	331–32,3398–99	(D)	(D)	(D)	(D)	253	(D)	(D)	(D)	(D)	289	(D)
Nonferrous metals and products	333–36	336	416	458	(D)	384	(D)	(D)	(D)	(D)	380	(D)
Fabricated metal products	34	842	829	895	783	881	904	939	974	1,017	1,158	1,111
Machinery	35	10,504	12,216	(D)	(D)	(D)	(D)	14,446	14,775	14,938	8,381	8,110
Office, computing, and accounting machines	357	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	4,950	4,106
Other machinery, except electrical	351–56,358–59	(D)	(D)	2,396	2,428	2,682	2,729	(D)	(D)	(D)	3,431	4,004
Electrical equipment	36	13,778	14,432	14,980	15,848	14,128	13,318	13,400	13,415	13,360	13,349	15,338
Radio and TV receiving equipment	365	(D)	(D)	133	139	149	96	114	(D)	(D)	(D)	(D)
Communication equipment	366	8,685	9,397	9,669	10,184	8,427	7,071	5,928	4,787	(D)	(D)	(D)
Electronic components	367	2,831	3,385	(D)	4,286	4,133	4,025	3,914	(D)	3,567	5,311	6,032
Other electrical equipment	361–64,369	(D)	(D)	(D)	1,239	1,419	2,126	3,444	(D)	(D)	(D)	(D)
Transportation equipment	37	(D)	(D)	31,275	34,246	34,775	33,859	31,361	27,428	27,494	27,258	28,087
Motor vehicles and motor vehicles equipment	371	6,057	6,984	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment	373–75,379	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles	372,376	18,858	22,231	21,050	24,458	24,168	22,331	20,635	16,629	17,158	15,056	14,260

See explanatory information and SOURCE at end of table.

Table A-3. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1984–94

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Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
		[Dollars in millions]										
Distribution by industry:												
Professional and scientific instruments	38	$4,602	$5,013	$5,103	$5,222	$5,530	$5,992	$7,055	$8,705	$9,542	$10,119	$11,441
Scientific and mechanical measuring instruments	381–82	(D)	(D)	(D)	(D)	1,959	2,366	3,346	(D)	5,156	5,681	6,952
Optical, surgical, photographic, and other instruments	384–87	(D)	(D)	(D)	(D)	3,571	3,626	3,709	(D)	4,386	4,438	4,489
Other manufacturing industries	27,31,39	(D)	(D)	382	(D)	(D)	(D)	(D)	(D)	660	(D)	(D)
Nonmanufacturing industries 1/	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	4,905	6,714	7,446	7,844	10,513	14,031	20,793	28,446	28,933	30,831	28,846
Distribution by size of company: [Number of employees]												
Total		74,800	84,239	87,823	92,155	97,015	102,055	109,727	116,952	119,110	117,400	119,595
Fewer than 500		4,402	5,866	7,071	7,163	(S)	7,809	(S)	13,172	13,557	14,620	13,966
500 to 999		1,439	1,648	1,902	1,725	1,669	1,825	2,154	8,000	7,958	3,230	3,608
1,000 to 4,999		5,520	6,240	7,472	7,262	7,622	7,881	8,411	10,453	11,886	13,334	14,617
5,000 to 9,999		3,251	4,022	4,251	4,501	5,245	5,756	6,746	8,049	8,258	9,135	8,912
10,000 to 24,999		11,351	11,109	10,493	12,043	11,506	10,450	12,486	15,770	15,744	15,421	15,972
25,000 or more		48,837	55,354	56,991	59,461	63,694	68,335	71,030	61,508	61,707	61,659	62,519

1/ Nonmanufacturing industries for 1990 and prior years included the following SICs only: 10–11, 14–17, 40–42, 44–51, 53–54, 56, 60, 62–63, 72–73, 78, 806–07, and 87.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

NOTE: As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-4. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1994

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Industry	SIC code	Total	Size of company					
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		[Dollars in millions]						
Total		$119,595	$13,966	$3,608	$14,617	$8,912	$15,972	$62,519
Food, kindred, and tobacco products	20,21	1,476	101	60	178	216	158	762
Textiles and apparel	22,23	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Lumber, wood products, and furniture	24,25	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Paper and allied products	26	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Chemicals and allied products	28	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Industrial chemicals	281–82,286	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Drugs and medicines	283	9,633	408	80	1,731	763	3,752	2,899
Other chemicals	284–85,287–89	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Petroleum refining and extraction	13,29	1,950	32	6	88	57	570	1,199
Rubber products	30	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Stone, clay, and glass products	32	591	87	(D)	97	76	230	(D)
Primary metals	33	690	120	34	158	125	(D)	(D)
Ferrous metals and products	331–32,3398–99	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Nonferrous metals and products	333–36	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Fabricated metal products	34	1,111	238	(D)	410	122	224	(D)
Machinery	35	8,110	1,509	532	2,231	1,305	(D)	(D)
Office, computing, and accounting machines	357	4,106	443	207	1,350	908	(D)	(D)
Other machinery, except electrical	351–56,358–59	4,004	1,065	325	881	397	(D)	(D)
Electrical equipment	36	15,338	1,482	587	2,128	941	2,547	7,652
Radio and TV receiving equipment	365	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Communication equipment	366	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Electronic components	367	6,032	612	371	916	748	(D)	(D)
Other electrical equipment	361–64,369	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Transportation equipment	37	28,087	87	141	555	444	1,110	25,749
Motor vehicles and motor vehicles equipment	371	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment	373–75,379	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles	372,376	14,260	40	(D)	325	185	(D)	12,795
Professional and scientific instruments	38	11,441	1,308	557	1,367	794	213	7,202
Scientific and mechanical measuring instruments	381–82	6,952	(D)	356	630	288	(D)	4,877
Optical, surgical, photographic, and other instruments	384–87	4,489	(D)	201	736	506	(D)	2,325

See explanatory information and SOURCE at end of table.

Table A-4. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1994

Page 2 of 2

Industry	SIC code	Total	Size of Company: Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		[Dollars in millions]						
Other manufacturing industries..........	27,31,39	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Nonmanufacturing industries..............	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	28,846	7,497	1,122	3,745	2,933	2,435	11,113

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-5. Total (company, Federal, and other) funds for industrial R&D performance, by industry, size of company, and size of R&D program: 1994

Page 1 of 2

Industry and size of company	SIC code	Total	Size of R&D program				
			Less than $200,000	$200,000 to $999,999	$1 million to $9.9 million	$10 million to $99.9 million	$100 million or more
		[Dollars in millions]					
Total		$119,595	$1,192	$3,914	$10,582	$20,647	$83,259
Distribution by industry:							
Food, kindred, and tobacco products	20,21	1,476	(D)	65	218	711	(D)
Textiles and apparel	22,23	(D)	(D)	32	131	158	0
Lumber, wood products, and furniture	24,25	(D)	(D)	31	56	97	0
Paper and allied products	26	(D)	12	24	124	387	(D)
Chemicals and allied products	28	(D)	(D)	145	743	2,616	14,241
Industrial chemicals	281–82,286	(D)	(D)	53	232	930	4,779
Drugs and medicines	283	9,633	11	71	331	1,004	8,216
Other chemicals	284–85,287–89	(D)	(D)	22	181	681	1,246
Petroleum refining and extraction	13,29	1,950	8	24	77	290	1,551
Rubber products	30	(D)	(D)	353	334	352	457
Stone, clay, and glass products	32	591	7	63	69	451	0
Primary metals	33	690	(D)	39	242	263	(D)
Ferrous metals and products	331–32,3398–99	(D)	(D)	17	96	123	0
Nonferrous metals and products	333–36	(D)	6	22	146	140	(D)
Fabricated metal products	34	1,111	(D)	121	324	453	(D)
Machinery	35	8,110	138	791	1,097	2,022	4,061
Office, computing, and accounting machines	357	4,106	22	115	324	744	2,901
Other machinery, except electrical	351–56,358–59	4,004	116	676	774	1,279	1,160
Electrical equipment	36	15,338	101	342	1,275	2,926	10,694
Radio and TV receiving equipment	365	(D)	2	14	37	(D)	0
Communication equipment	366	(D)	21	125	380	923	(D)
Electronic components	367	6,032	28	75	502	1,309	4,118
Other electrical equipment	361–64,369	(D)	50	128	356	(D)	(D)
Transportation equipment	37	28,087	41	65	231	929	26,821
Motor vehicles and motor vehicles equipment	371	(D)	12	20	159	(D)	(D)
Other transportation equipment	373–75,379	(D)	22	14	44	(D)	(D)
Aircraft and missiles	372,376	14,260	6	31	28	328	13,867
Professional and scientific instruments	38	11,441	83	285	1,140	2,264	7,669
Scientific and mechanical measuring instruments	381–82	6,952	36	227	481	1,185	5,023
Optical, surgical, photographic, and other instruments	384–87	4,489	47	58	659	1,079	2,646

See explanatory information and SOURCE at end of table.

Table A-5. Total (company, Federal, and other) funds for industrial R&D performance, by industry, size of company, and size of R&D program: 1994

Page 2 of 2

Industry and size of company	SIC code	Total	Size of R&D program				
			Less than $200,000	$200,000 to $999,999	$1 million to $9.9 million	$10 million to $99.9 million	$100 million or more
		[Dollars in millions]					
Other manufacturing industries	27,31,39	(D)	(D)	$107	$317	$350	$0
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	28,846	542	1,428	4,204	6,379	16,292
Distribution by size of company: [Number of employees]							
Total		119,595	1,192	3,914	10,582	20,647	83,259
Fewer than 500		13,966	1,161	3,606	6,396	2,803	0
500 to 999		3,608	(D)	150	1,297	2,022	(D)
1,000 to 4,999		14,617	(D)	124	2,266	8,279	(D)
5,000 to 9,999		8,912	1	20	317	2,923	5,651
10,000 to 24,999		15,972	0	11	217	3,207	12,536
25,000 or more		62,519	0	3	88	1,414	61,014

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-6. Number of R&D-performing companies, by industry, size of company, and size of R&D program: 1994

Page 1 of 2

Industry and size of company	SIC code	Total	Size of R&D program				
			Less than $200,000	$200,000 to $999,999	$1 million to $9.9 million	$10 million to $99.9 million	$100 million or more
Total		40,878	27,208	8,250	4,548	726	147
Food, kindred, and tobacco products	20,21	864	619	151	65	27	2
Textiles and apparel	22,23	302	160	85	49	8	0
Lumber, wood products, and furniture	24,25	733	622	77	27	6	0
Paper and allied products	26	687	590	43	38	14	2
Chemicals and allied products	28	1,798	1,173	316	194	79	36
Industrial chemicals	281–82,286	457	220	129	73	23	12
Drugs and medicines	283	400	141	142	68	29	20
Other chemicals	284–85,287–89	941	812	45	53	27	4
Petroleum refining and extraction	13,29	189	102	55	16	9	7
Rubber products	30	1,257	332	801	109	13	3
Stone, clay, and glass products	32	366	230	97	25	13	0
Primary metals	33	507	272	123	97	14	1
Ferrous metals and products	331–32,3398–99	247	166	47	27	7	0
Nonferrous metals and products	333–36	260	106	76	70	7	1
Fabricated metal products	34	1,883	1,429	304	134	15	1
Machinery	35	5,186	3,092	1,672	331	73	18
Office, computing, and accounting machines	357	514	171	219	85	26	13
Other machinery, except electrical	351–56,358–59	4,672	2,921	1,453	246	47	5
Electrical equipment	36	3,025	1,728	760	424	96	17
Radio and TV receiving equipment	365	109	68	27	13	1	0
Communication equipment	366	616	185	268	129	27	6
Electronic components	367	1,224	821	178	174	43	8
Other electrical equipment	361–64,369	1,077	655	286	107	25	3
Transportation equipment	37	951	678	146	79	30	18
Motor vehicles and motor vehicles equipment	371	394	286	34	57	14	4
Other transportation equipment	373–75,379	368	306	44	13	3	2
Aircraft and missiles	372,376	189	86	68	9	13	12
Professional and scientific instruments	38	2,357	1,334	650	290	72	11
Scientific and mechanical measuring instruments	381–82	1,272	606	484	139	37	6
Optical, surgical, photographic, and other instruments	384–87	1,085	728	166	151	35	5
Other manufacturing industries	27,31,39	908	508	282	106	11	0
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	19,868	14,339	2,687	2,565	246	31

See explanatory information and SOURCE at end of table.

Table A-6. Number of R&D-performing companies, by industry, size of company, and size of R&D program: 1994

Page 2 of 2

Industry and size of company	SIC code	Total	Size of R&D program				
			Less than $200,000	$200,000 to $999,999	$1 million to $9.9 million	$10 million to $99.9 million	$100 million or more
Distribution by size of company: [Number of employees]							
Total		40,878	27,208	8,250	4,548	726	147
Fewer than 500		38,074	26,912	7,639	3,377	146	0
500 to 999		995	144	320	443	87	1
1,000 to 4,999		1,238	136	233	582	263	24
5,000 to 9,999		253	11	34	79	104	25
10,000 to 24,999		191	4	18	46	87	36
25,000 or more		127	1	5	21	39	61

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-7. Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1984–94

Page 1 of 2

Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
		[Dollars in millions]										
Total		$51,404	$57,043	$59,932	$61,403	$66,672	$73,501	$81,602	$90,580	$94,388	$94,591	$97,131
Distribution by industry:												
Food, kindred, and tobacco products	20,21	1,081	1,136	1,280	1,204	1,173	1,244	1,248	1,277	1,386	1,345	1,476
Textiles and apparel	22,23	182	218	246	243	215	(S)	260	236	261	286	316
Lumber, wood products, and furniture	24,25	143	147	144	137	165	192	216	200	234	196	201
Paper and allied products	26	594	576	538	604	752	879	1,059	1,174	1,182	1,191	1,263
Chemicals and allied products	28	7,736	8,310	8,664	9,445	10,828	11,943	13,168	14,439	15,091	16,658	16,559
Industrial chemicals	281–82,286	3,057	3,281	3,374	3,531	3,939	4,340	4,902	5,225	4,911	5,165	4,780
Drugs and medicines	283	3,310	3,481	3,657	4,095	4,900	5,512	5,917	6,947	7,934	9,132	9,625
Other chemicals	284–85,287–89	1,369	1,548	1,633	1,819	1,989	2,091	2,349	2,267	2,246	2,361	2,154
Petroleum refining and extraction	13,29	2,245	2,194	1,971	1,883	1,975	2,162	2,289	2,487	2,268	2,138	1,939
Rubber products	30	671	659	655	596	718	867	1,056	(D)	1,256	1,059	1,432
Stone, clay, and glass products	32	705	825	941	985	697	615	538	455	479	529	553
Primary metals	33	683	730	786	711	620	666	717	706	514	646	672
Ferrous metals and products	31–32,3398–99	357	323	336	249	252	244	231	225	221	272	241
Nonferrous metals and products	333–36	326	407	450	462	368	422	486	481	293	374	431
Fabricated metal products	34	773	780	800	633	718	726	736	748	723	936	868
Machinery	35	9,312	10,721	10,701	10,577	11,929	13,342	13,575	13,720	13,903	8,295	8,011
Office, computing, and accounting machines	357	7,011	8,418	8,380	8,193	9,347	10,725	10,988	10,419	10,614	4,917	4,078
Other machinery, except electrical	351–56,358–59	2,301	2,303	2,321	2,384	2,582	2,618	2,587	3,301	3,289	3,378	3,933
Electrical equipment	36	9,037	9,271	9,767	10,449	9,975	9,575	9,267	8,865	9,516	11,682	13,537
Radio and TV receiving equipment	365	362	350	133	139	149	96	114	(D)	93	87	64
Communication equipment	366	5,147	5,174	5,117	5,455	4,798	4,159	3,584	(S)	3,381	3,954	4,939
Electronic components	367	2,354	2,826	3,357	3,630	3,684	3,655	3,496	3,177	3,320	5,105	5,870
Other electrical equipment	361–64,369	1,174	921	1,160	1,225	1,345	1,664	2,073	(D)	2,722	2,537	2,664
Transportation equipment	37	10,406	12,092	13,567	13,462	13,910	14,596	14,264	14,858	16,292	16,640	17,695
Motor vehicles and motor vehicles equipment	371	5,384	6,164	7,171	7,167	7,783	8,756	8,594	9,063	9,132	10,659	11,950
Other transportation equipment	373–75,379	258	279	330	356	361	337	283	262	289	297	279
Aircraft and missiles	372,376	4,764	5,649	6,066	5,939	5,766	5,503	5,387	5,533	6,871	5,684	5,466

See explanatory information and SOURCE at end of table.

Table A-7. Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1984–94

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Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
		[Dollars in millions]										
Distribution by industry:												
Professional and scientific instruments	38	$4,211	$4,622	$4,752	$4,950	$5,339	$5,729	$6,318	$6,840	$7,321	$7,542	$8,058
Scientific and mechanical measuring instruments	381–82	1,671	1,596	1,521	1,598	1,863	2,205	2,696	3,017	3,013	3,196	3,687
Optical, surgical, photographic, and other instruments	384–87	2,540	3,026	3,231	3,352	3,476	3,524	3,621	3,823	4,308	4,346	4,371
Other manufacturing industries	27,31,39	373	361	380	380	401	438	541	(D)	599	758	796
Nonmanufacturing industries 1/	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	3,252	4,401	4,740	5,144	7,257	10,302	16,351	22,941	23,363	24,690	23,756
Distribution by size of company: [Number of employees]												
Total		51,404	57,043	59,932	61,403	66,672	73,501	81,602	90,580	94,388	94,591	97,131
Fewer than 500		3,781	5,127	6,203	6,200	(S)	(S)	(S)	11,285	11,532	13,006	12,802
500 to 999		1,341	1,531	1,765	1,610	1,748	1,934	2,144	7,819	7,807	3,048	3,426
1,000 to 4,999		4,618	5,249	6,243	6,281	6,820	7,546	8,363	9,403	10,865	12,219	13,533
5,000 to 9,999		2,764	3,350	3,455	3,753	4,075	4,509	4,997	7,233	7,495	8,371	8,067
10,000 to 24,999		8,546	8,366	8,489	9,681	10,512	11,631	12,890	12,397	12,328	12,606	13,625
25,000 or more		30,354	33,420	33,777	33,878	36,785	40,703	45,106	42,443	44,361	45,340	45,658

1/ Nonmanufacturing industries for 1990 and prior years included the following SICs only: 10–11, 14–17, 40–42, 44–51, 53–54, 56, 60, 62–63, 72–73, 78, 806–07, and 87.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

NOTES: Company funds include funds for industrial R&D work performed within company facilities from all sources except the Federal Government. The funds may be the companies' own or from outside organizations such as research institutions, universities and colleges, nonprofit organizations, other companies, and state governments. Company-financed R&D not performed within the company is excluded. As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-8. Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1994

Page 1 of 1

Industry	SIC code	Total	Size of company: Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		[Dollars in millions]						
Total		$97,131	$12,802	$3,426	$13,533	$8,087	$13,625	$45,658
Food, kindred, and tobacco products	20,21	1,476	101	60	178	216	158	762
Textiles and apparel	22,23	316	45	23	139	(D)	90	(D)
Lumber, wood products, and furniture	24,25	201	40	14	50	80	(D)	(D)
Paper and allied products	26	1,263	34	15	94	117	282	721
Chemicals and allied products	28	16,559	705	216	2,872	1,434	5,860	5,471
Industrial chemicals	281–82,286	4,780	159	(D)	672	407	1,482	(D)
Drugs and medicines	283	9,625	402	80	1,729	763	3,751	2,898
Other chemicals	284–85,287–89	2,154	143	(D)	470	264	627	(D)
Petroleum refining and extraction	13,29	1,939	31	6	88	57	568	1,190
Rubber products	30	1,432	465	(D)	315	77	110	(D)
Stone, clay, and glass products	32	553	55	(D)	92	75	230	(D)
Primary metals	33	672	120	34	153	119	(D)	(D)
Ferrous metals and products	331–32,3398–99	241	22	4	70	74	(D)	(D)
Nonferrous metals and products	333–36	431	98	30	83	45	(D)	(D)
Fabricated metal products	34	868	233	58	238	(D)	181	(D)
Machinery	35	8,011	1,473	529	2,221	1,287	(D)	(D)
Office, computing, and accounting machines	357	4,078	434	207	1,342	902	(D)	(D)
Other machinery, except electrical	351–56,358–59	3,933	1,039	322	880	385	(D)	(D)
Electrical equipment	36	13,537	1,453	585	2,097	926	2,546	5,930
Radio and TV receiving equipment	365	64	27	8	29	0	0	0
Communication equipment	366	4,939	525	113	861	(D)	(D)	(D)
Electronic components	367	5,870	603	369	885	734	(D)	(D)
Other electrical equipment	361–64,369	2,664	298	94	322	(D)	371	(D)
Transportation equipment	37	17,695	82	126	458	416	457	16,155
Motor vehicles and motor vehicles equipment	371	11,950	12	79	179	156	(D)	(D)
Other transportation equipment	373–75,379	279	35	(D)	51	(D)	(D)	(D)
Aircraft and missiles	372,376	5,466	35	(D)	228	(D)	218	4,781
Professional and scientific instruments	38	8,058	1,227	454	1,308	770	164	4,134
Scientific and mechanical measuring instruments	381–82	3,687	(D)	260	574	271	(D)	1,895
Optical, surgical, photographic, and other instruments	384–87	4,371	(D)	194	735	499	(D)	2,239
Other manufacturing industries	27, 31, 39	796	206	(D)	181	181	172	(D)
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–8, 87, 89	23,756	6,532	1,066	3,049	2,223	1,080	9,805

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-9. Company-financed R&D contracted to outside organizations, by industry and size of company: 1991, 1993, and 1994

Page 1 of 2

Industry	SIC code	1991	1993	1994
		[Dollars in millions]		
Total		$3,319	$3,462	$3,618
Distribution by industry:				
Food, kindred, and tobacco products	20,21	44	43	43
Textiles and apparel	22,23	(D)	2	4
Lumber, wood products, and furniture	24,25	(D)	8	8
Paper and allied products	26	12	5	4
Chemicals and allied products	28	1087	1,117	1,239
Industrial chemicals	281–82,286	95	43	38
Drugs and medicines	283	771	942	1,055
Other chemicals	284–85,287–89	221	132	146
Petroleum refining and extraction	13,29	35	56	52
Rubber products	30	18	65	22
Stone, clay, and glass products	32	(D)	2	6
Primary metals	33	24	12	15
Ferrous metals and products	331–32,3398–99	4	8	10
Nonferrous metals and products	333–36	20	4	5
Fabricated metal products	34	3	21	21
Machinery	35	256	125	200
Office, computing, and accounting machines	357	229	52	113
Other machinery, except electrical	351–56,358–59	27	73	87
Electrical equipment	36	114	143	116
Radio and TV receiving equipment	365	0	(D)	1
Communication equipment	366	63	20	38
Electronic components	367	38	24	24
Other electrical equipment	361–64,369	13	(D)	54
Transportation equipment	37	687	(D)	591
Motor vehicles and motor vehicles equipment	371	(D)	(D)	(D)
Other transportation equipment	373–75,379	(S)	(D)	(D)
Aircraft and missiles	372,376	(D)	52	83
Professional and scientific instruments	38	(D)	189	57
Scientific and mechanical measuring instruments	381–82	4	25	16
Optical, surgical, photographic, and other instruments	384–87	(D)	163	40
Other manufacturing industries	27,31,39	2	31	72
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	742	1,123	1,168

See explanatory information and SOURCE at end of table.

Table A-9. Company-financed R&D contracted to outside organizations, by industry and size of company: 1991, 1993, and 1994

Page 2 of 2

Industry	SIC code	1991	1993	1994
		[Dollars in millions]		
Distribution by size of company: [Number of employees]				
Total		$3,319	$3,462	$3,618
Fewer than 500		(S)	751	724
500 to 999		35	107	126
1,000 to 4,999		275	310	397
5,000 to 9,999		218	327	408
10,000 to 24,999		881	468	391
25,000 or more		1762	1,497	1,574

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent.

NOTE: As a result of a new sample design and corrections to reported data, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-10. Number of companies contracting R&D performance to outside organizations and total number of R&D-performing companies, by industry and size of company: 1994

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Industry	SIC code	Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees		25,000 or more employees	
		Total	Outside	Total	Outside	Total	Outside	Total	Outside	Total	Outside	Total	Outside
Total		38,074	3,983	995	106	1,238	212	253	59	191	34	127	37
Food, kindred, and tobacco products	20,21	622	96	122	6	76	9	20	6	13	4	11	2
Textiles and apparel	22,23	194	44	34	4	57	6	7	1	9	0	1	0
Lumber, wood products, and furniture	24,25	652	20	31	7	38	5	9	0	1	0	2	0
Paper and allied products	26	617	0	10	2	36	7	10	1	9	1	5	0
Chemicals and allied products	28	1,599	298	61	8	84	15	22	4	22	7	10	5
Industrial chemicals	281–82,286	372	105	40	1	27	4	6	0	8	2	5	1
Drugs and medicines	283	346	119	8	4	27	6	6	1	9	4	4	3
Other chemicals	284–85,287–89	882	75	13	3	30	5	10	3	5	1	1	1
Petroleum refining and extraction	13,29	148	12	7	0	17	4	3	1	7	2	6	3
Rubber products	30	1,145	10	41	4	59	6	7	0	3	0	2	1
Stone, clay, and glass products	32	316	64	19	2	20	8	5	0	5	0	1	1
Primary metals	33	394	8	43	1	46	12	17	6	5	2	3	1
Ferrous metals and products	331–32,3398–99	185	3	15	0	31	9	13	5	2	1	1	1
Nonferrous metals and products	333–36	208	5	27	1	15	3	4	1	3	1	2	0
Fabricated metal products	34	1,719	171	57	5	92	6	4	0	10	1	1	1
Machinery	35	4,895	687	133	11	122	13	20	4	13	0	3	2
Office, computing, and accounting machines	357	461	53	20	0	25	3	5	1	2	0	1	1
Other machinery, except electrical	351–56,358–59	4,434	635	113	11	97	10	15	3	11	0	2	1
Electrical equipment	36	2,787	250	91	13	111	13	13	3	13	1	10	2
Radio and TV receiving equipment	365	100	13	4	1	5	0	0	0	0	0	0	0
Communication equipment	366	567	122	18	4	25	2	1	0	2	0	3	0
Electronic components	367	1,146	7	30	5	37	3	7	1	2	0	2	1
Other electrical equipment	361–64,369	975	107	39	3	44	8	5	2	9	1	5	1

See explanatory information and SOURCE at end of table.

Table A-10. Number of companies contracting R&D performance to outside organizations and total number of R&D-performing companies, by industry and size of company: 1994

Page 2 of 2

Industry	SIC code	Size of company											
		Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees		25,000 or more employees	
		Total	Outside	Total	Outside	Total	Outside	Total	Outside	Total	Outside	Total	Outside
Transportation equipment	37	782	131	66	4	61	13	17	4	11	2	14	4
Motor vehicles and motor vehicles equipment	371	284	71	54	2	36	7	10	2	6	1	4	1
Other transportation equipment	373–75,379	345	30	8	2	10	2	2	1	2	0	2	0
Aircraft and missiles	372,376	154	29	4	0	15	4	5	1	3	1	8	3
Professional and scientific instruments	38	2,204	281	69	7	63	14	10	1	3	0	8	1
Scientific and mechanical measuring instruments	381–82	1,195	125	44	5	21	2	5	0	2	0	5	1
Optical, surgical, photographic, and other instruments	384–87	1,009	156	25	2	42	12	5	1	1	0	3	0
Other manufacturing industries	27,31,39	795	97	34	6	52	10	16	2	9	0	2	0
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	19,207	1,814	178	25	304	70	73	26	58	14	48	14

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-11. Company-financed R&D performed outside the United States by U.S. domestic companies and their foreign subsidiaries, by selected industry: 1984–94

Page 1 of 1

Industry	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
		[Dollars in millions]										
Total		$3,633	$3,650	$4,624	$5,226	$6,208	$6,706	$7,952	$9,147	$10,063	$9,565	$9,395
Food, kindred, and tobacco products	20,21	70	75	69	37	27	42	41	66	88	112	117
Chemicals and allied products	28	786	843	1,071	1,243	1,548	1,532	2,007	2,401	2,676	2,833	2,456
Industrial and other chemicals	281–82,284–89	385	444	579	625	855	609	720	1,009	1,045	1,318	917
Drugs and medicines	283	401	399	492	618	693	923	1,287	1,392	1,631	1,516	1,539
Petroleum refining and extraction	13,29	101	47	40	47	59	47	76	107	119	104	111
Stone, clay, and glass products	32	60	(D)	(D)	(D)	(D)	(D)	59	38	41	38	27
Primary metals	33	9	(D)	(D)	18	23	24	26	20	18	12	15
Fabricated metal products	34	21	21	26	40	(D)	(D)	95	86	109	119	125
Machinery	35	740	689	951	1,233	1,326	1,432	1,451	1,476	1,439	340	308
Electrical equipment	36	537	591	(S)	432	591	573	770	651	568	525	495
Radio and TV receiving equipment	365	(D)	(D)	(D)	0	(D)	(D)	(D)	2	(D)	(D)	3
Communication equipment	366	(D)	(D)	(D)	188	290	199	174	151	(D)	(D)	110
Electronic components	367	92	117	150	204	246	160	185	164	168	322	276
Other electrical equipment	361–64,369	30	24	25	39	(D)	(D)	(D)	334	217	113	107
Transportation equipment	37	907	1,025	(D)	(D)	1,750	1,916	2,055	2,402	(D)	(D)	(D)
Motor vehicles and other transportation equipment	371.373–75,379	(D)	(D)	(D)	(D)	1,477	1,501	1,901	2,166	(D)	(D)	(D)
Aircraft and missiles	372,376	(D)	(D)	182	237	273	415	154	236	493	(D)	251
Professional and scientific instruments	38	263	169	212	317	404	474	611	656	685	751	900
Other manufacturing industries	22–27,30–31,39	131	125	141	138	178	269	344	467	524	547	572
Nonmanufacturing industries 1/	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	8	18	27	64	146	256	415	778	835	1,770	1,500

1/ Nonmanufacturing industries for 1990 and prior years included the following SICs only: 10–11, 14–17, 40–42, 44–51, 53–54, 56, 60, 62–63, 72–73, 78, 806–07, and 87.

KEY:

(D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent. Prior to 1993, data have been withheld.

NOTES: As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-12. Federal funds for industrial R&D performance, by industry and size of company: 1984–94

Page 1 of 2

Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
		[Dollars in millions]										
Total		$23,396	$27,196	$27,891	$30,752	$30,343	$28,554	$28,125	$26,372	$24,722	$22,809	$22,463
Distribution by industry:												
Food, kindred, and tobacco products	20,21	(D)	(D)	(D)	2	(D)	(D)	(D)	0	0	0	0
Textiles and apparel	22,23	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(S)	(D)	(D)	(D)
Lumber, wood products, and furniture	24,25	0	0	0	0	(D)	0	0	(D)	(D)	(D)	(D)
Paper and allied products	26	(D)	(D)	(D)	(D)	(D)	0	0	(D)	(D)	(D)	(D)
Chemicals and allied products	28	191	230	179	190	238	126	123	209	(S)	(D)	(D)
Industrial chemicals	281–82,286	183	217	178	185	232	111	109	165	(S)	(D)	(D)
Drugs and medicines	283	(D)	(D)	1	(D)	6	(D)	(D)	(D)	(S)	15	8
Other chemicals	284–85,287–89	(D)	(D)	0	(D)	0	(D)	(D)	(D)	(S)	(D)	(D)
Petroleum refining and extraction	13,29	(D)	(D)	(D)	14	22	(S)	(S)	11	9	14	10
Rubber products	30	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Stone, clay, and glass products	32	(D)	(D)	9	10	(D)	(D)	(D)	(D)	(D)	9	38
Primary metals	33	(D)	(D)	(D)	19	17	22	(D)	8	(S)	23	17
Ferrous metals and products	331–32,3398–99	(D)	(D)	(D)	(D)	1	(D)	(D)	1	(D)	17	(D)
Nonferrous metals and products	333–36	10	9	8	(D)	16	(D)	(D)	7	(D)	6	(D)
Fabricated metal products	34	69	49	95	150	163	178	203	226	294	222	243
Machinery	35	1,192	1,495	(D)	(D)	(D)	(D)	871	1,055	1,035	86	99
Office, computing, and accounting machines	357	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	33	28
Other machinery, except electrical	351–56,358–59	(D)	(D)	75	44	101	112	(D)	(D)	(D)	53	71
Electrical equipment	36	4,741	5,161	5,213	5,399	4,153	3,743	4,133	4,550	3,844	1,667	1,801
Radio and TV receiving equipment	365	(D)	(D)	0	0	0	0	0	0	(D)	(D)	(D)
Communication equipment	366	3,538	4,223	4,552	4,729	3,630	2,911	2,344	(D)	(D)	(D)	(D)
Electronic components	367	477	559	(D)	656	449	369	418	(D)	247	206	162
Other electrical equipment	361–64,369	(D)	(D)	(D)	14	74	463	1,371	(D)	(D)	(D)	(D)
Transportation equipment	37	(D)	(D)	17,708	20,784	20,865	19,262	17,097	12,570	11,202	10,617	10,392
Motor vehicles and motor vehicles equipment	371	673	820	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment	373–75,379	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles	372,376	14,094	16,582	14,984	18,519	18,402	16,828	15,248	11,096	(S)	9,372	8,794

See explanatory information and SOURCE at end of table.

Table A-12. Federal funds for industrial R&D performance, by industry and size of company: 1984–94

Page 2 of 2

Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
		[Dollars in millions]										
Distribution by industry:												
Professional and scientific instruments	38	$391	$391	$351	$272	$191	$263	$737	$1,865	$2,221	$2,577	$3,384
Scientific and mechanical measuring instruments	381–82	(D)	(D)	(D)	(D)	(S)	(S)	(S)	(D)	2,143	2,484	3,266
Optical, surgical, photographic, and other instruments	384–87	(D)	(D)	(D)	(D)	95	101	87	(D)	78	92	118
Other manufacturing industries	27,31,39	(D)	(D)	2	(D)	(D)	(D)	(D)	(D)	61	(D)	(D)
Nonmanufacturing industries 1/	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	1,653	2,313	2,706	2,700	3,256	3,729	4,442	5,505	5,570	6,140	5,090
Distribution by size of company: [Number of employees]												
Total		23,396	27,196	27,891	30,752	30,343	28,554	28,125	26,372	24,722	22,809	22,463
Fewer than 500		621	739	868	963	816	901	895	1,887	2,025	1,614	1,164
500 to 999		98	117	137	115	131	117	(S)	181	151	182	182
1,000 to 4,999		902	991	1,229	981	1,093	958	881	1,050	(S)	1,115	1,083
5,000 to 9,999		487	672	796	748	864	740	257	816	763	764	825
10,000 to 24,999		2,805	2,743	2,004	2,362	1,705	1,129	1,526	3,373	3,416	2,816	2,348
25,000 or more		18,483	21,934	23,213	25,583	25,734	24,709	24,436	19,065	17,346	16,319	16,862

1/ Nonmanufacturing industries for 1990 and prior years included the following SICs only: 10–11, 14–17, 40–42, 44–51, 53–54, 56, 60, 62–63, 72–73, 78, 806–07, and 87.

KEY:

(D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent.

NOTE: As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A–13. Number of R&D-performing companies reporting Federal R&D funds and total number of R&D-performing companies, by industry and size of company: 1994

Page 1 of 2

Industry	SIC code	Size of company											
		Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees		25,000 or more employees	
		Total	Federal	Total	Federal	Total	Federal	Total	Federal	Total	Federal	Total	Federal
Total		38,074	1,041	995	37	1,238	62	253	24	191	31	127	51
Food, kindred, and tobacco products	20,21	622	0	122	0	76	0	20	0	13	0	11	0
Textiles and apparel	22,23	194	3	34	0	57	0	7	0	9	0	1	1
Lumber, wood products, and furniture	24,25	652	3	31	0	38	0	9	0	1	0	2	0
Paper and allied products	26	617	0	10	0	36	0	10	0	9	0	5	2
Chemicals and allied products	28	1,599	23	61	1	84	7	22	1	22	6	10	5
Industrial chemicals	281–82,286	372	0	40	0	27	4	6	1	8	3	5	4
Drugs and medicines	283	346	22	8	0	27	3	6	0	9	1	4	1
Other chemicals	284–85,287–89	882	1	13	1	30	0	10	0	5	2	1	0
Petroleum refining and extraction	13,29	148	1	7	0	17	0	3	0	7	2	6	3
Rubber products	30	1,145	0	41	0	59	0	7	0	3	1	2	0
Stone, clay, and glass products	32	316	64	19	0	20	3	5	1	5	0	1	1
Primary metals	33	394	3	43	0	46	2	17	2	5	2	3	1
Ferrous metals and products	331–32,3398–99	185	1	15	0	31	0	13	2	2	1	1	0
Nonferrous metals and products	333–36	208	2	27	0	15	2	4	0	3	1	2	1
Fabricated metal products	34	1,719	16	57	2	92	5	4	1	10	2	1	1
Machinery	35	4,895	157	133	3	122	4	20	3	13	2	3	2
Office, computing, and accounting machines	357	461	47	20	1	25	3	5	1	2	0	1	1
Other machinery, except electrical	351–56,358–59	4,434	110	113	2	97	1	15	2	11	2	2	1
Electrical equipment	36	2,787	116	91	3	111	6	13	3	13	1	10	6
Radio and TV receiving equipment	365	100	1	4	0	5	0	0	0	0	0	0	0
Communication equipment	366	567	8	18	0	25	1	1	0	2	0	3	2
Electronic components	367	1,146	9	30	1	37	5	7	2	2	0	2	1
Other electrical equipment	361–64,369	975	98	39	2	44	0	5	1	9	1	5	3
Transportation equipment	37	782	4	66	1	61	4	17	4	11	4	14	13
Motor vehicles and motor vehicles equipment	371	284	0	54	0	36	0	10	1	6	1	4	3
Other transportation equipment	373–75,379	345	1	8	0	10	0	2	0	2	0	2	2
Aircraft and missiles	372,376	154	3	4	1	15	4	5	3	3	3	8	8

See explanatory information and SOURCE at end of table.

Table A-13. Number of R&D-performing companies reporting Federal R&D funds and total number of R&D-performing companies, by industry and size of company: 1994

Page 2 of 2

Industry	SIC code	Size of company											
		Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees		25,000 or more employees	
		Total	Federal	Total	Federal	Total	Federal	Total	Federal	Total	Federal	Total	Federal
Professional and scientific instruments	38	2,204	141	69	14	63	7	10	3	3	2	8	6
Scientific and mechanical measuring instruments	381–82	1,195	131	44	13	21	5	5	2	2	2	5	5
Optical, surgical, photographic, and other instruments	384–87	1,009	10	25	1	42	2	5	1	1	0	3	1
Other manufacturing industries	27,31,39	795	2	34	0	52	0	16	0	9	1	2	0
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	19,207	509	178	12	304	24	73	6	58	8	48	10

SOURCE: National Science Foundation/SRS, *Research and Development in Industry: 1994*

Table A-14. Industry-administered federally funded R&D centers (FFRDCs)—funds by character of work, full-time-equivalent (FTE) R&D scientists and engineers, and total number of employees: 1986–94

Page 1 of 1

Item	1986	1987	1988	1989	1990	1991	1992	1993	1994
	[Dollars in millions]								
Total R&D funds	$1,891	$1,995	$2,122	$2,195	$2,323	$2,277	$2,353	$1,965	$2,202
Basic research	117	142	337	398	499	461	474	492	503
Applied research	629	623	371	374	386	433	507	435	503
Development	1,145	1,230	1,414	1,423	1,438	1,383	1,373	1,039	1,196
	[Employment]								
Number of FTE R&D scientists and engineers 1/	7,432	8,432	10,994	11,618	12,438	11,977	11,770	8,083	8,362
Total employment 2/	24,156	33,804	36,143	35,716	42,153	39,697	40,755	23,930	23,905

1/ These data were recorded in January of the year following that indicated.

2/ These data were recorded in March of the year indicated.

NOTE: Industry-administered Federally funded research and development centers (FFRDCs) conduct R&D almost exclusively for use by the Federal Government. Data for these FFRDCs administered by industry are included in Federal R&D support under the industry classifications of the administering firms. See section B for a listing of industry-administered FFRDCs and their locations.

SOURCE: National Science Foundation/SRS, *Research and Development in Industry: 1994*

Table A-15. Concentration of total, Federal, and company and other R&D funds and net sales of R&D-performing companies, by size of R&D program: 1984–94

Page 1 of 1

Companies ranked by size of R&D program	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
	Percent of total (company, Federal, and other) R&D funds										
First 4 (1–4)	17%	18%	19%	19%	18%	19%	18%	16%	15%	17%	15%
Next 4 (5–8)	13	12	11	12	12	13	13	8	8	7	8
Next 12 (9–20)	17	17	14	16	17	16	15	12	13	13	14
Next 20 (21–40)	13	13	13	12	12	12	12	11	11	12	13
Next 60 (41–100)	18	16	15	14	15	15	16	15	15	16	15
Next 100 (101–200)	9	9	10	8	8	8	9	12	12	8	9
Next 200 (201–400)	6	5	8	6	7	6	7	6	6	7	7
	Percent of Federal R&D funds										
First 4 (1–4)	30	29	30	31	31	36	38	14	11	23	26
Next 4 (5–8)	15	15	16	18	18	15	16	21	18	17	19
Next 12 (9–20)	26	27	28	27	27	30	26	21	27	32	32
Next 20 (21–40)	17	16	15	15	15	11	12	15	13	16	13
Next 60 (41–100)	10	7	7	7	6	6	6	13	11	5	7
Next 100 (101–200)	1	2	2	1	3	1	1	3	4	5	2
Next 200 (201–400)	0	0	1	0	0	0	0	2	2	2	1
	Percent of company and other (except Federal) R&D funds										
First 4 (1–4)	22	23	20	20	21	22	21	17	17	17	16
Next 4 (5–8)	8	7	7	7	7	7	7	7	8	7	7
Next 12 (9–20)	12	12	12	12	12	13	12	10	12	12	12
Next 20 (21–40)	12	12	10	11	12	12	13	10	11	11	11
Next 60 (41–100)	18	18	16	16	16	16	17	16	17	14	14
Next 100 (101–200)	11	10	10	10	10	10	10	15	14	9	9
Next 200 (201–400)	7	7	8	8	8	8	8	7	7	8	8
	Percent of net sales ranked by size of total R&D funds										
First 4 (1–4)	7	8	8	7	7	6	8	7	8	8	8
Next 4 (5–8)	4	4	5	5	5	5	4	3	3	3	2
Next 12 (9–20)	5	5	5	5	5	5	5	4	4	4	5
Next 20 (21–40)	8	8	7	7	6	5	5	4	4	4	5
Next 60 (41–100)	12	12	10	11	11	12	12	12	12	11	10
Next 100 (101–200)	13	13	10	8	9	8	9	9	9	8	8
Next 200 (201–400)	14	15	9	12	10	11	12	11	11	10	10

NOTES: Companies were ranked individually for each year; therefore, particular companies comprising the size groups may have changed from year to year.

As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-16. Domestic net sales of R&D-performing companies, by industry and size of company: 1993–94

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Industry	SIC code	Total	Size of company: Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		[Dollars in millions] 1993						
Total		$3,208,865	$261,964	$96,110	$515,886	$358,532	$615,956	$1,360,418
Food, kindred, and tobacco products	20,21	288,510	13,247	9,364	50,755	35,076	46,628	133,440
Textiles and apparel	22,23	51,202	7,488	(D)	13,695	4,414	12,344	(D)
Lumber, wood products, and furniture	24,25	29,862	5,323	2,782	10,154	5,814	(D)	(D)
Paper and allied products	26	110,244	3,996	3,739	14,298	9,379	30,505	48,326
Chemicals and allied products	28	278,581	19,344	9,104	48,713	33,324	85,607	82,489
Industrial chemicals	281–82,286	118,092	3,650	3,065	18,961	13,482	36,385	42,549
Drugs and medicines	283	73,115	3,805	1,451	14,239	7,022	(D)	(D)
Other chemicals	284–85,287–89	87,374	11,890	4,587	15,513	12,821	(D)	(D)
Petroleum refining and extraction	13,29	238,345	2,423	639	21,220	11,509	93,318	109,236
Rubber products	30	51,422	12,332	5,182	14,150	6,850	(D)	(D)
Stone, clay, and glass products	32	35,168	3,923	(D)	6,919	5,656	13,454	(D)
Primary metals	33	94,448	5,340	(D)	22,374	19,633	21,182	(D)
Ferrous metals and products	331–32,3398–99	63,118	2,695	(D)	16,633	13,778	10,603	(D)
Nonferrous metals and products	333–36	31,330	2,644	(D)	5,741	5,855	10,579	(D)
Fabricated metal products	34	83,266	14,910	(D)	22,829	7,053	32,099	(D)
Machinery	35	182,978	33,008	13,430	48,571	32,982	26,365	28,622
Office, computing, and accounting machines	357	50,209	6,122	2,892	16,473	17,894	(D)	(D)
Other machinery, except electrical	351–56,358–59	132,769	26,886	10,537	32,098	15,088	(D)	(D)
Electrical equipment	36	215,494	20,176	9,928	38,116	10,369	29,586	107,317
Radio and TV receiving equipment	365	2,165	(D)	(D)	1,308	0	0	0
Communication equipment	366	38,973	5,136	1,486	8,780	0	(D)	(D)
Electronic components	367	65,314	7,156	3,850	15,124	(D)	(D)	(D)
Other electrical equipment	361–64,369	109,041	(D)	(D)	12,905	(D)	15,189	67,517
Transportation equipment	37	426,245	7,551	3,402	38,684	27,112	37,816	311,681
Motor vehicles and motor vehicles equipment	371	290,504	5,366	1,065	32,971	17,172	(D)	(D)
Other transportation equipment	373–75,379	15,621	1,654	1,110	1,944	4,582	(D)	(D)
Aircraft and missiles	372,376	120,121	531	1,227	3,769	5,358	12,365	96,871

See explanatory information and SOURCE at end of table.

Table A-16. Domestic net sales of R&D-performing companies, by industry and size of company: 1993–94

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Industry	SIC code	Total	Size of company					
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		[Dollars in millions] 1993						
Professional and scientific instruments	38	$104,694	$12,373	$6,566	$18,543	$6,091	$9,413	$51,708
Scientific and mechanical measuring instruments	381–82	49,572	6,022	(D)	7,326	2,778	(D)	22,958
Optical, surgical, photographic, and other instruments	384–87	55,122	6,351	(D)	11,217	3,313	(D)	28,750
Other manufacturing industries	27,31,39	60,525	11,089	(D)	13,358	10,247	15,296	(D)
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	957,882	89,441	15,486	133,507	133,022	157,760	428,666
		[Dollars in millions] 1994						
Total		3,595,278	343,987	116,833	582,384	400,872	706,139	1,445,062
Food, kindred, and tobacco products	20,21	302,528	12,427	12,160	57,680	33,830	50,250	136,182
Textiles and apparel	22,23	50,284	4,717	(D)	14,704	4,073	16,779	(D)
Lumber, wood products, and furniture	24,25	32,193	4,914	2,415	10,781	7,403	(D)	(D)
Paper and allied products	26	130,358	16,808	1,347	15,372	14,387	36,193	46,252
Chemicals and allied products	28	322,039	29,423	9,511	52,769	39,391	93,368	97,576
Industrial chemicals	281–82,286	143,233	16,804	5,885	18,970	11,137	39,004	51,432
Drugs and medicines	283	94,328	3,444	(D)	15,713	10,589	32,310	(D)
Other chemicals	284–85,287–89	84,477	9,176	(D)	18,086	17,664	22,055	(D)
Petroleum refining and extraction	13,29	235,280	1,838	1,065	24,744	11,582	89,211	106,840
Rubber products	30	62,223	19,289	3,553	16,366	6,213	(D)	(D)
Stone, clay, and glass products	32	35,778	3,319	(D)	6,620	5,179	14,307	(D)
Primary metals	33	116,624	7,668	8,839	22,381	30,748	18,662	28,326
Ferrous metals and products	331–32,3398–99	69,915	5,058	1,793	13,679	21,328	(D)	(D)
Nonferrous metals and products	333–36	46,710	2,611	7,046	8,702	9,420	(D)	(D)

See explanatory information and SOURCE at end of table.

Table A-16. Domestic net sales of R&D-performing companies, by industry and size of company: 1993–94

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Industry	SIC code	Total	Size of company: Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		[Dollars in millions] 1994						
Fabricated metal products	34	$91,075	$25,945	(D)	$27,036	$6,996	$23,626	(D)
Machinery	35	210,835	58,946	$16,328	52,135	29,452	(D)	(D)
Office, computing, and accounting machines	357	51,709	9,123	3,072	17,521	10,489	(D)	(D)
Other machinery, except electrical	351–56,358–59	159,126	49,823	13,256	34,614	18,964	(D)	(D)
Electrical equipment	36	259,693	30,526	11,677	42,493	18,894	41,687	114,417
Radio and TV receiving equipment	365	6,650	1,678	945	4,028	0	0	0
Communication equipment	366	48,152	6,490	1,948	10,366	(D)	(D)	(D)
Electronic components	367	80,312	11,852	4,472	15,803	(D)	(D)	(D)
Other electrical equipment	361–64,369	124,579	10,505	4,312	12,296	5,110	21,986	70,370
Transportation equipment	37	477,508	6,558	6,610	46,686	36,476	44,139	337,038
Motor vehicles and motor vehicles equipment	371	350,952	2,989	5,376	36,662	(D)	(D)	(D)
Other transportation equipment	373–75,379	23,431	2,488	867	4,676	(D)	(D)	(D)
Aircraft and missiles	372,376	103,125	1,081	367	5,348	4,729	8,176	83,424
Professional and scientific instruments	38	124,541	19,365	7,270	19,472	9,331	5,607	63,496
Scientific and mechanical measuring instruments	381–82	63,419	6,698	(D)	6,748	4,331	(D)	36,953
Optical, surgical, photographic, and other instruments	384–87	61,121	12,667	(D)	12,724	5,000	(D)	26,543
Other manufacturing industries	27,31,39	72,809	9,534	(D)	15,343	13,132	24,074	(D)
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	1,071,511	92,712	22,765	157,803	133,784	202,089	462,359

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-17. Total (company, Federal, and other) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1984–94

[In percent]

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Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Total		3.9%	4.4%	4.7%	4.6%	4.5%	4.3%	4.2%	4.2%	4.2%	3.8%	3.6%
Distribution by industry:												
Food, kindred, and tobacco products	20,21	(D)	(D)	(D)	0.6	(D)	(D)	(D)	0.5	0.5	0.5	0.5
Textiles and apparel	22,23	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	0.6	(D)	(D)
Lumber, wood products, and furniture	24,25	0.7	0.8	0.6	0.6	(D)	0.6	0.6	(D)	(D)	(D)	(D)
Paper and allied products	26	(D)	(D)	(D)	(D)	(D)	0.8	1.0	1.1	(D)	(D)	(D)
Chemicals and allied products	28	4.7	5.0	5.2	5.3	5.3	5.4	5.3	5.4	5.5	(D)	(D)
Industrial chemicals	281–82,286	4.0	4.4	4.6	4.7	4.4	4.2	4.5	4.6	4.6	(D)	(D)
Drugs and medicines	283	(D)	(D)	8.5	(D)	8.8	(D)	(D)	8.9	9.6	12.5	10.2
Other chemicals	284–85,287–89	(D)	(D)	3.3	(D)	3.4	(D)	(D)	3.1	2.7	(D)	(D)
Petroleum refining and extraction	13,29	(D)	(D)	(D)	1.0	1.0	0.9	0.9	1.0	0.9	0.9	0.8
Rubber products	30	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Stone, clay, and glass products	32	(D)	(D)	2.5	2.6	(D)	(D)	(D)	(D)	(D)	1.5	1.7
Primary metals	33	(D)	(D)	(D)	0.9	0.8	0.8	0.8	0.8	0.6	0.7	0.6
Ferrous metals and products	331–32,3398–99	(D)	(D)	(D)	(D)	0.5	(D)	(D)	(D)	(D)	0.5	(D)
Nonferrous metals and products	333–36	1.2	1.4	1.5	(D)	1.0	(D)	(D)	(D)	(D)	1.2	(D)
Fabricated metal products	34	1.5	1.5	1.5	1.5	1.3	1.5	1.4	1.5	1.5	1.4	1.2
Machinery	35	6.4	7.6	(D)	(D)	7.7	7.9	7.7	8.1	7.8	4.6	3.8
Office, computing, and accounting machines	357	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	9.9	7.9
Other machinery, except electrical	351–56,358–59	(D)	(D)	3.0	3.0	2.9	(D)	(D)	(D)	(D)	2.6	2.5
Electrical equipment	36	6.8	7.6	7.9	8.2	7.5	7.3	6.5	6.5	5.6	6.2	5.9
Radio and TV receiving equipment	365	(D)	(D)	3.6	3.2	2.4	1.8	1.6	(D)	(D)	(D)	(D)
Communication equipment	366	9.8	10.1	9.9	10.2	10.7	11.6	10.0	(D)	(D)	(D)	(D)
Electronic components	367	7.8	9.6	(D)	10.0	9.0	(D)	8.3	7.9	7.5	8.1	7.5
Other electrical equipment	361–64,369	(D)	(D)	(D)	2.7	2.5	(D)	3.7	(D)	(D)	(D)	(D)
Transportation equipment	37	(D)	(D)	8.3	8.7	8.9	8.1	7.5	7.3	7.1	6.4	5.9
Motor vehicles and motor vehicles equipment	371	3.4	3.8	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment	373–75,379	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles	372,376	15.4	14.9	13.4	14.7	16.3	13.5	11.8	12.1	11.8	12.5	13.8

See explanatory information and SOURCE at end of table.

Table A-17. Total (company, Federal, and other) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1984–94

[In percent]

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Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Professional and scientific instruments	38	8.3%	8.9%	8.8%	7.9%	7.4%	7.2%	8.0%	9.1%	9.4%	9.7%	9.2%
Scientific and mechanical measuring instruments	381–82	(D)	(D)	(D)	(D)	7.9	7.4	8.6	10.0	10.6	11.5	11.0
Optical, surgical, photographic, and other instruments	384–87	(D)	(D)	(D)	(D)	7.3	7.3	7.7	8.1	8.3	8.1	7.3
Other manufacturing industries	27,31,39	(D)	(D)	1.2	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Distribution by size of company: [Number of employees]												
Total		3.9	4.4	4.7	4.6	4.5	4.3	4.2	4.2	4.2	3.8	3.6
Fewer than 500		2.9	3.6	4.1	3.9	3.7	3.6	3.4	3.3	3.4	3.7	2.6
500 to 999		2.3	2.4	2.4	2.3	1.8	1.8	1.9	2.5	2.8	2.9	2.6
1,000 to 4,999		2.2	2.6	2.5	2.6	2.4	2.2	2.0	2.5	2.8	2.6	2.6
5,000 to 9,999		1.8	1.9	2.3	2.3	2.3	2.6	2.9	3.0	2.9	2.9	2.2
10,000 to 24,999		3.1	3.1	3.2	3.1	3.1	2.8	2.7	3.6	3.2	2.9	2.7
25,000 or more		5.3	6.2	6.5	6.6	6.3	5.8	5.6	5.6	5.6	5.2	5.2

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

NOTE: As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-18. Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1984–94

[In percent]

Page 1 of 2

Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Total		2.6%	3.0%	3.2%	3.1%	3.1%	3.1%	3.1%	3.2%	3.3%	3.1%	2.9%
Distribution by industry:												
Food, kindred, and tobacco products	20,21	0.4	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Textiles and apparel	22,23	0.5	0.5	0.5	0.4	0.4	0.5	0.6	0.6	0.6	0.6	0.6
Lumber, wood products, and furniture	24,25	0.7	0.8	0.6	0.6	0.6	0.6	0.6	0.9	0.9	0.7	0.6
Paper and allied products	26	0.8	0.8	0.7	0.6	0.8	0.8	1.0	1.1	1.0	1.1	1.0
Chemicals and allied products	28	4.6	4.9	5.1	5.2	5.2	5.4	5.3	5.3	5.4	6.0	5.1
Industrial chemicals	281–82,286	3.8	4.2	4.4	4.4	4.2	4.1	4.4	4.4	4.4	4.4	3.3
Drugs and medicines	283	8.2	8.0	8.4	8.7	8.8	8.9	8.8	8.9	9.6	12.5	10.2
Other chemicals	284–85,287–89	2.9	3.1	3.3	3.3	3.4	3.9	3.4	3.0	2.7	2.7	2.5
Petroleum refining and extraction	13,29	0.7	0.9	1.1	1.0	1.0	0.9	0.9	1.0	0.9	0.9	0.8
Rubber products	30	1.9	1.8	1.7	1.6	1.7	1.9	2.1	2.3	2.3	2.1	2.3
Stone, clay, and glass products	32	1.9	2.3	2.4	2.5	2.0	1.8	1.7	1.6	1.6	1.5	1.5
Primary metals	33	0.9	0.9	1.0	0.9	0.7	0.7	0.8	0.8	0.6	0.7	0.6
Ferrous metals and products	331–32,3398–99	0.6	0.5	0.7	0.6	0.5	0.5	0.5	0.5	0.4	0.4	0.3
Nonferrous metals and products	333–36	1.2	1.4	1.5	1.3	1.0	1.0	1.2	1.2	0.7	1.2	0.9
Fabricated metal products	34	1.4	1.4	1.4	1.2	1.1	1.2	1.1	1.2	1.1	1.1	1.0
Machinery	35	5.8	6.7	7.3	7.1	6.8	7.3	7.2	7.5	7.3	4.5	3.8
Office, computing, and accounting machines	357	10.5	12.4	12.4	12.3	11.2	13.1	14.4	14.9	13.7	9.8	7.9
Other machinery, except electrical	351–56,358–59	2.5	2.6	2.9	3.0	2.8	2.6	2.3	2.9	2.9	2.5	2.5
Electrical equipment	36	4.5	4.8	5.1	5.4	5.3	5.2	4.5	4.3	4.0	5.4	5.2
Radio and TV receiving equipment	365	3.7	4.3	3.6	3.2	2.4	1.8	1.6	1.0	0.6	4.0	1.0
Communication equipment	366	5.1	5.4	5.2	5.5	6.1	6.8	6.1	6.1	7.0	10.1	10.3
Electronic components	367	6.6	8.2	9.2	8.5	8.0	7.7	7.4	7.2	7.0	7.8	7.3
Other electrical equipment	361–64,369	2.2	2.0	2.2	2.6	2.3	2.3	2.2	2.2	2.1	2.3	2.1
Transportation equipment	37	3.3	3.4	3.6	3.4	3.5	3.5	3.4	4.0	4.2	3.9	3.7
Motor vehicles and motor vehicles equipment	371	3.0	3.1	3.3	3.4	3.4	3.7	3.7	4.1	4.0	3.7	3.4
Other transportation equipment	373–75,379	2.0	2.3	2.7	2.5	2.6	2.5	2.1	2.1	2.1	1.9	1.2
Aircraft and missiles	372,376	4.0	3.9	4.0	3.6	3.9	3.3	3.1	4.0	4.7	4.7	5.3

See explanatory information and SOURCE at end of table.

Table A–18. Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1984–94

[In percent]

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Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Professional and scientific instruments	38	7.6%	8.3%	8.2%	7.5%	7.1%	6.8%	7.1%	7.1%	7.2%	7.2%	6.5%
Scientific and mechanical measuring instruments	381–82	8.3	8.4	8.4	8.1	7.6	6.9	6.9	6.3	6.2	6.4	5.8
Optical, surgical, photographic, and other instruments	384–87	7.3	8.1	8.0	7.2	7.1	7.1	7.5	8.0	8.2	7.9	7.2
Other manufacturing industries	27,31,39	1.1	1.0	1.2	1.1	1.0	0.9	0.9	0.8	1.3	1.3	1.1
Distribution by size of company: [Number of employees]												
Total		2.6	3.0	3.2	3.1	3.1	3.1	3.1	3.2	0.0	0.0	0.0
Fewer than 500		2.8	3.4	4.0	3.8	3.7	3.5	3.3	3.2	3.2	3.6	2.5
500 to 999		2.2	2.2	2.2	2.2	1.7	1.7	1.7	2.4	2.7	2.7	2.5
1,000 to 4,999		2.0	2.4	2.4	2.4	2.3	2.1	1.9	2.4	2.7	2.5	2.5
5,000 to 9,999		1.6	1.8	2.0	2.0	2.0	2.1	2.8	2.9	2.8	2.8	2.2
10,000 to 24,999		2.5	2.5	2.6	2.5	2.6	2.5	2.5	3.0	2.6	2.5	2.5
25,000 or more		3.2	3.5	3.7	3.8	3.7	3.7	3.6	3.8	4.0	3.7	3.6

NOTE: As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-19. Total (company, Federal, and other) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and ranked by size of R&D program: 1994

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Industry	SIC code	Total R&D funds as a percent of net sales [Percent]			Total R&D funds [Dollars in millions]		
		First 4 companies	Next 4 companies	Next 12 companies	First 4 companies	Next 4 companies	Next 12 companies
Total		6.4%	16.5%	8.9%	$18,293	$9,199	$16,452
Food, kindred, and tobacco products	20,21	1.0	0.5	0.4	595	203	248
Textiles and apparel	22,23	0.9	1.2	0.6	108	50	66
Lumber, wood products, and furniture	24,25	1.1	1.1	1.0	76	31	30
Paper and allied products	26	2.6	1.1	0.5	883	139	151
Chemicals and allied products	28	7.4	7.2	6.1	7,823	3,108	4,388
Industrial chemicals	281–82,286	7.5	6.0	3.2	3,339	898	1,085
Drugs and medicines	283	10.6	10.0	13.5	3,238	1,982	2,996
Other chemicals	284–85,287–89	3.9	2.8	2.0	1,246	228	307
Petroleum refining and extraction	13,29	1.4	1.0	0.3	1,155	477	245
Rubber products	30	5.6	1.6	2.7	546	149	151
Stone, clay, and glass products	32	2.0	2.7	1.2	280	96	110
Primary metals	33	0.7	0.7	0.5	303	97	115
Ferrous metals and products	331–32,3398–99	0.3	0.8	0.6	89	43	67
Nonferrous metals and products	333–36	1.6	0.5	0.4	214	54	49
Fabricated metal products	34	5.2	1.0	1.3	360	125	154
Machinery	35	7.3	6.0	6.3	2,475	1,125	1,594
Office, computing, and accounting machines	357	11.4	8.4	10.1	1,443	750	1,120
Other machinery, except electrical	351–56,358–59	4.8	3.8	3.4	1,032	375	474
Electrical equipment	36	7.7	6.5	4.5	9,962	1,261	1,570
Radio and TV receiving equipment	365	0.8	1.7	2.2	29	10	17
Communication equipment	366	16.1	11.7	9.9	(D)	421	552
Electronic components	367	10.1	9.4	6.3	3,508	610	711
Other electrical equipment	361–64,369	3.3	2.5	1.7	(D)	220	290
Transportation equipment	37	6.9	7.7	4.2	20,937	5,236	1,582
Motor vehicles and motor vehicles equipment	371	5.1	1.1	1.1	12,484	279	217
Other transportation equipment	373–75,379	5.4	0.8	0.5	582	32	25
Aircraft and missiles	372,376	17.8	12.6	9.7	7,871	4,924	1,340
Professional and scientific instruments	38	11.1	12.3	8.0	6,761	1,304	1,136
Scientific and mechanical measuring instruments	381–82	12.9	13.7	7.7	4,272	933	617
Optical, surgical, photographic, and other instruments	384–87	9.0	9.7	8.5	2,489	371	519
Other manufacturing industries	27,31,39	3.5	2.2	0.6	230	80	111

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

NOTES: Rankings were based on total (company, Federal, and other) R&D funds.
As a result of a new sample design, statistics for 1988–91 have been revised since originally published.
These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-20. Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and ranked by size of company-financed R&D program: 1994

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Industry	SIC code	Company and other R&D funds as a percent of net sales [Percent] First 4 companies	Next 4 companies	Next 12 companies	Company and other R&D funds [Dollars in millions] First 4 companies	Next 4 companies	Next 12 companies
Total		5.6%	7.5%	7.4%	$15,967	$7,251	$11,201
Food, kindred, and tobacco products	20,21	1.0	0.5	0.4	595	203	248
Textiles and apparel	22,23	2.1	0.4	0.6	98	48 (S)	66
Lumber, wood products, and furniture	24,25	1.1	1.1	1.0	76	31	29
Paper and allied products	26	2.4	1.1	0.5	842	139	151
Chemicals and allied products	28	6.6	6.2	6.1	6,881	2,860	4,331
Industrial chemicals	281–82,286	5.7	3.4	3.2	2,397	667	1,034
Drugs and medicines	283	10.6	10.0	13.5	3,238	1,982	2,994
Other chemicals	284–85,287–89	3.9	3.2	1.8	1,246	211	303
Petroleum refining and extraction	13,29	1.4	0.9	0.3	1,148	477	243
Rubber products	30	3.9	2.0	2.7	490	131	151
Stone, clay, and glass products	32	2.0	1.7	1.5	279	94	108
Primary metals	33	0.7	0.7	0.5	292	97	110
Ferrous metals and products	331–32,3398–99	0.3	0.8	0.6	89	43	61
Nonferrous metals and products	333–36	1.5	0.5	0.4	203	54	49
Fabricated metal products	34	2.0	0.7	1.7	207	88	117
Machinery	35	7.2	5.9	6.6	2,449	1,110	1,580
Office, computing, and accounting machines	357	11.4	8.4	10.0	1,438	750	1,107
Other machinery, except electrical	351–56,358–59	4.7	3.6	3.6	1,011	360	473
Electrical equipment	36	6.8	4.9	4.4	8,320	1,177	1,566
Radio and TV receiving equipment	365	0.8	1.7	2.2	29	10	16
Communication equipment	366	12.1	11.7	9.9	3,270 (S)	421	552
Electronic components	367	12.0	4.8	5.7	3,482	526	708
Other electrical equipment	361–64,369	2.4	2.5	1.7	1,538	220	290
Transportation equipment	37	5.0	1.8	2.2	15,517	1,062	819
Motor vehicles and motor vehicles equipment	371	4.6	1.1	1.1	11,299	279	202
Other transportation equipment	373–75,379	1.7	0.8	0.5	187	32	25
Aircraft and missiles	372,376	7.5	2.5	4.2	4,031	750	591
Professional and scientific instruments	38	6.9	8.0	6.9	4,065	913	1,044
Scientific and mechanical measuring instruments	381–82	5.3	7.2	5.9	1,662	549	527
Optical, surgical, photographic, and other instruments	384–87	8.7	9.5	8.5	2,403	364	517
Other manufacturing industries	27,31,39	3.5	2.2	0.6	229	80	111

KEY: (S) = Indicates imputation of more than 50 percent.

NOTES: Rankings were based on total (company, Federal, and other) R&D funds.
As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-21. Federal R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and ranked by size of federally financed R&D program: 1994

Page 1 of 1

Industry	SIC code	Federal R&D funds as a percent of net sales [Percent]			Federal R&D funds [Dollars in millions]		
		First 4 companies	Next 4 companies	Next 12 companies	First 4 companies	Next 4 companies	Next 12 companies
Total		21.1%	2.1%	5.2%	$5,939	$4,377	$7,155
Food, kindred, and tobacco products	20,21	0.0	0.0	0.0	0	0	0
Textiles and apparel	22,23	0.2	0.0	0.0	(D)	0	0
Lumber, wood products, and furniture	24,25	6.4	0.0	0.0	(D)	0	0
Paper and allied products	26	0.2	0.0	0.0	(D)	0	0
Chemicals and allied products	28	3.0	0.1	0.0	(D)	15	4
Industrial chemicals	281–82,286	3.5	0.1	0.0	(D)	11	4 (S)
Drugs and medicines	283	0.2	0.1	0.0	4	4	0
Other chemicals	284–85,287–89	0.4	0.0	0.0	(D)	0	0
Petroleum refining and extraction	13,29	0.0	0.0	0.0	10	0	0
Rubber products	30	4.4	0.0	0.0	(D)	0	0
Stone, clay, and glass products	32	0.1	1.9	0.0	7	31	0
Primary metals	33	0.1	0.0	0.0	17	0	0
Ferrous metals and products	331–32,3398–99	0.1	0.0	0.0	(D)	0	0
Nonferrous metals and products	333–36	0.1	0.0	0.0	(D)	0	0
Fabricated metal products	34	4.5	0.4	0.1	216	24	2
Machinery	35	0.2	0.2	4.6	56	15	28
Office, computing, and accounting machines	357	0.4	0.2	2.1	19	5	3
Other machinery, except electrical	351–56,358–59	0.2	0.3	5.5	37	10	24
Electrical equipment	36	2.2	0.5	0.2	1,771	17	13
Radio and TV receiving equipment	365	1.4	0.0	0.0	(D)	0	0
Communication equipment	366	6.9	1.4	1.4	(D)	(D)	1
Electronic components	367	1.4	1.7	0.8	(D)	(D)	8
Other electrical equipment	361–64,369	0.9	0.1	0.1	(D)	4	4
Transportation equipment	37	2.9	6.0	3.5	6,906	2,835	651
Motor vehicles and motor vehicles equipment	371	0.6	0.0	0.0	(D)	0	0
Other transportation equipment	373–75,379	5.8	0.0	0.0	(D)	0	0
Aircraft and missiles	372,376	16.8	6.1	3.5	5,308	2,835	651
Professional and scientific instruments	38	7.0	2.2	2.5	2,981	206	160
Scientific and mechanical measuring instruments	381–82	9.4	2.2	2.6	2,877	195	156
Optical, surgical, photographic, and other instruments	384–87	0.9	2.1	0.8	105	10	3
Other manufacturing industries	27,31,39	0.0	0.0	0.0	(D)	0	0

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-22. Total (company, Federal, and other) funds for performance of basic research, applied research, and development, in current and constant dollars: 1953–94

Page 1 of 2

Year	Total		Basic research		Applied research		Development	
	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars
	[Dollars in millions]							
1953 1/	$3,630	$16,500	$151	$686	$726	$3,300	$2,753	$12,514
1954 1/	4,070	18,333	166	748	814	3,667	3,090	13,919
1955 1/	4,640	19,414	189	791	928	3,883	3,523	14,741
1956	6,605	27,987	253	1,072	1,268	5,373	5,084	21,542
1957	7,731	31,684	271	1,111	1,670	6,844	5,790	23,730
1958	8,389	33,691	295	1,185	1,911	7,675	6,183	24,831
1959	9,618	37,570	320	1,250	1,991	7,777	7,307	28,543
1960	10,509	40,419	376	1,446	2,029	7,804	8,104	31,169
1961	10,908	41,475	395	1,502	1,977	7,517	8,536	32,456
1962	11,464	42,617	488	1,814	2,449	9,104	8,527	31,699
1963	12,630	46,434	522	1,919	2,457	9,033	9,651	35,482
1964	13,512	48,780	549	1,982	2,600	9,386	10,363	37,412
1965	14,185	49,947	592	2,085	2,658	9,359	10,935	38,504
1966	15,548	52,884	624	2,122	2,843	9,670	12,081	41,092
1967	16,385	54,076	629	2,076	2,915	9,620	12,841	42,380
1968	17,429	54,808	642	2,019	3,124	9,824	13,663	42,965
1969	18,308	54,814	618	1,850	3,287	9,841	14,403	43,123
1970	18,067	51,327	602	1,710	3,427	9,736	14,038	39,881
1971	18,320	49,380	590	1,590	3,415	9,205	14,315	38,585
1972	19,552	50,332	593	1,523	3,514	9,057	15,445	39,807
1973	21,249	51,450	631	1,528	3,825	9,262	16,793	40,661
1974	22,887	50,973	699	1,557	4,288	9,550	17,900	39,866
1975	24,187	49,161	730	1,484	4,570	9,289	18,887	38,388
1976	26,997	51,620	819	1,566	5,112	9,774	21,066	40,279
1977	29,825	53,354	911	1,630	5,636	10,082	23,278	41,642
1978 1/	33,304	55,231	1,035	1,716	6,300	10,448	25,969	43,066
1979	38,226	58,271	1,158	1,765	7,225	11,014	29,843	45,492
1980 1/	44,505	62,071	1,325	1,848	8,450	11,785	34,730	48,438
1981	51,810	65,665	1,614	2,046	10,699	13,560	33,497	50,060
1982 1/	58,650	69,988	1,904	2,272	12,323	14,705	44,423	53,011
1983	65,268	74,849	2,223	2,549	13,927	15,971	49,118	56,328
1984	74,800	82,198	2,608	2,866	15,765	17,324	56,427	62,008
1985	84,239	89,236	2,862	3,032	18,255	19,338	63,122	66,867
1986	87,823	90,633	4,047	4,176	19,759	20,391	64,017	66,065
1987	92,155	92,155	4,324	4,324	19,813	19,813	68,018	68,018
1988	97,015	93,373	4,500	4,331	20,748	19,969	71,767	69,073
1989	102,055	94,060	5,216	4,807	22,691	20,913	74,148	68,339

See explanatory information and SOURCE on next page.

Table A-22. Total (company, Federal, and other) funds for performance of basic research, applied research, and development, in current and constant dollars: 1953–94

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Year	Total		Basic research		Applied research		Development	
	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars
	[Dollars in millions]							
1990	$109,727	$96,846	$5,128	$4,526	$24,785	$21,876	$79,814	$70,445
1991	116,952	99,449	7,837	6,664	27,446	23,338	81,669	69,446
1992	119,110	98,519	7,002	5,792	26,168	21,644	85,940	71,084
1993	117,400	95,061	6,919	5,602	24,686	19,989	85,796	69,470
1994	119,595	94,841	7,017	5,565	23,490	18,628	89,088	70,649

1/ Character-of-work estimates were made by the National Science Foundation. See: National Science Foundation, *National Patterns of R&D Resources: 1994*, Final Report, NSF 95–304.

NOTES: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

The 1987 GNP implicit price deflators were used to convert current dollars to constant dollars.

As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-23. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1992

Page 1 of 2

Distribution by industry	SIC code	Total			Basic			Applied			Development		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[Dollars in millions]											
Total		$119,110	$24,722	$94,388	$7,002	$1,186	$5,816	$26,168	$4,983	$21,184	$85,940	$18,555	$67,385
Food, kindred, and tobacco products	20,21	1,386	0	1,386	132	0	132	454	0	454	800	0	800
Textiles and apparel	22,23	(D)	(D)	261	33	0	33	(D)	(D)	35	202	10	192
Lumber, wood products, and furniture	24,25	(D)	(D)	234	(D)	(D)	17	83	0	83	(D)	(D)	134
Paper and allied products	26	(D)	(D)	1,182	(D)	0	(D)	(D)	(D)	(D)	493	0	493
Chemicals and allied products	28	15,381	(S)	15,091	(D)	(D)	1,978	5,052	17	5,035	(D)	(D)	8,078
Industrial chemicals	281–82,286	5,165	(S)	4,911	(D)	(D)	529	1,165	14	1,151	(D)	(D)	3,231
Drugs and medicines	283	7,944	(S)	7,934	(D)	(D)	1,319	(D)	(D)	3,057	(D)	(D)	3,558
Other chemicals	284–85,287–89	2,272	(S)	2,246	(D)	(D)	130	(D)	(D)	827	(D)	(D)	1,289
Petroleum refining and extraction	13,29	2,277	9	2,268	(D)	(D)	(D)	1,051	0	1,051	(D)	(D)	(D)
Rubber products	30	(D)	(D)	1,256	76	0	76	195	0	195	(D)	(D)	985
Stone, clay, and glass products	32	(D)	(D)	479	(D)	(D)	40	(D)	(D)	175	(D)	(D)	263
Primary metals	33	522	(S)	514	(D)	(D)	30	(D)	(D)	220	264	2	262
Ferrous metals and products	331–32,3398–99	(D)	(D)	221	(D)	(D)	(D)	(D)	0	(D)	(D)	(D)	115
Nonferrous metals and products	333–36	(D)	(D)	293	(D)	0	(D)	(D)	(D)	(D)	(D)	(D)	148
Fabricated metal products	34	1,017	294	723	(D)	(D)	54	(D)	(D)	156	803	290	513
Machinery	35	14,938	1,035	13,903	(D)	(D)	711	(D)	(D)	1,848	11,932	586	11,347
Office, computing, and accounting machines	357	(D)	(D)	10,614	(D)	(D)	(D)	(D)	(D)	1,029	(D)	(D)	(D)
Other machinery, except electrical	351–56,358–59	(D)	(D)	3,289	(D)	(D)	(D)	844	25	819	(D)	(D)	(D)
Electrical equipment	36	13,360	3,844	9,516	(D)	(D)	313	(D)	(D)	2,676	9,311	2,783	6,527
Radio and TV receiving equipment	365	(D)	(D)	93	(D)	(D)	(D)	8	0	8	(D)	(D)	(D)
Communication equipment	366	(D)	(D)	3,381	(D)	(D)	(D)	(D)	(D)	819	(D)	(D)	(D)
Electronic components	367	3,567	247	3,320	(D)	(D)	110	(D)	(D)	813	2,578	181	2,397
Other electrical equipment	361–64,369	(D)	(D)	2,722	(D)	(D)	138	(D)	(D)	1,035	(D)	(D)	1,548
Transportation equipment	37	27,494	11,202	16,292	(D)	(D)	124	(D)	(D)	1,228	24,869	9,928	14,941
Motor vehicles and motor vehicles equipment	371	(D)	(D)	9,132	62	0	62	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment	373–75,379	(D)	(D)	289	(D)	(D)	26	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles	372,376	17,158	(S)	6,871	270	235	35	1,739	976	763	15,148	9,076	6,072

See explanatory information and SOURCE at end of table.

Table A-23. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1992

Page 2 of 2

Distribution by industry	SIC code	Total			Basic			Applied			Development		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[Dollars in millions]											
Professional and scientific instruments	38	$9,542	$2,221	$7,321	(D)	(D)	$477	(D)	(D)	$1,979	$6,711	$1,847	$4,864
Scientific and mechanical measuring instruments	381–82	5,156	2,143	3,013	(D)	(D)	150	(D)	(D)	1,048	3,602	1,788	1,815
Optical, surgical, photographic, and other instruments	384–87	4,386	78	4,308	(D)	(D)	327	(D)	(D)	931	3,109	59	3,050
Other manufacturing industries	27,31,39	660	61	599	$79	$0	79	(D)	(D)	100	(D)	(D)	420
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	28,933	5,570	23,363	2,270	894	1,376	$7,369	$1,933	5,436	19,294	2,743	16,551

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-24. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1993

Page 1 of 2

Distribution by industry	SIC code	Total			Basic			Applied			Development		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[Dollars in millions]											
Total		$117,400	$22,809	$94,591	$6,919	$958	$5,961	$24,686	$4,730	$19,956	$85,796	$17,118	$68,678
Food, kindred, and tobacco products	20,21	1,345	0	1,345	96	0	96	434	0	434	814	0	814
Textiles and apparel	22,23	(D)	(D)	286	(D)	(D)	44	(D)	(D)	34	(D)	(D)	208
Lumber, wood products, and furniture	24,25	(D)	(D)	196	(D)	(D)	15	48	0	48	(D)	(D)	133
Paper and allied products	26	(D)	(D)	1,191	(D)	(D)	197	(D)	(D)	537	459	0	459
Chemicals and allied products	28	(D)	(D)	16,658	2,276	12	2,264	(D)	(D)	5,810	(D)	(D)	8,584
Industrial chemicals	281–82,286	(D)	(D)	5,165	(D)	(D)	918	(D)	(D)	1,266	(D)	(D)	2,981
Drugs and medicines	283	9,146	15	9,132	(D)	(D)	(D)	3,768	8	3,760	(D)	(D)	(D)
Other chemicals	284–85,287–89	(D)	(D)	2,361	(D)	(D)	(D)	(D)	(D)	783	(D)	(D)	(D)
Petroleum refining and extraction	13,29	2,152	14	2,138	(D)	(D)	(D)	(D)	(D)	(D)	1,084	11	1,073
Rubber products	30	(D)	(D)	1,059	29	0	29	(D)	(D)	160	(D)	(D)	870
Stone, clay, and glass products	32	538	9	529	(D)	(D)	54	(D)	(D)	180	302	7	295
Primary metals	33	669	23	646	(D)	(D)	47	217	6 (S)	211	(D)	(D)	388
Ferrous metals and products	331–32,3398–99	289	17	272	(D)	(D)	21	(D)	(D)	86	(D)	(D)	165
Nonferrous metals and products	333–36	380	6	374	25	0	25	(D)	(D)	125 (S)	(D)	(D)	223
Fabricated metal products	34	1,158	222	936	(D)	(D)	96	189	8	182	(D)	(D)	659
Machinery	35	8,381	86	8,295	(D)	(D)	283	(D)	(D)	1,616	6,461	65	6,396
Office, computing, and accounting machines	357	4,950	33	4,917	(D)	(D)	92	(D)	(D)	950	3,903	28	3,875
Other machinery, except electrical	351–56,358–59	3,431	53	3,378	(D)	(D)	191	(D)	(D)	666	2,557	37	2,521
Electrical equipment	36	13,349	1,667	11,682	(D)	(D)	364	(D)	(D)	2,904	9,819	1,403	8,422
Radio and TV receiving equipment	365	(D)	(D)	87	10	0	10	(D)	(D)	12	(D)	(D)	64
Communication equipment	366	(D)	(D)	3,954	(D)	(D)	(D)	576	0	576	(D)	(D)	(D)
Electronic components	367	5,311	206	5,105	(D)	1	(D)	1,429	35 (S)	1,394	(D)	170	(D)
Other electrical equipment	361–64,369	(D)	(D)	2,537	(D)	(D)	113	(D)	(D)	919	(D)	(D)	1,504
Transportation equipment	37	27,258	10,617	16,640	(D)	(D)	136	2,008	905	1,103	(D)	(D)	15,401
Motor vehicles and motor vehicles equipment	371	(D)	(D)	10,659	(D)	(D)	74	(D)	(D)	462	(D)	(D)	10,123
Other transportation equipment	373–75,379	(D)	(D)	297	(D)	0	(D)	(D)	(D)	12	(D)	(D)	(D)
Aircraft and missiles	372,376	15,056	9,372	5,684	(D)	(D)	(D)	1,453	825	628	(D)	(D)	(D)

See explanatory information and SOURCE at end of table.

Table A-24. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1993

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Distribution by industry	SIC code	Total			Basic			Applied			Development		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[Dollars in millions]											
Professional and scientific instruments	38	$10,119	$2,577	$7,542	(D)	(D)	$402	$2,093	$297	$1,796	(D)	(D)	$5,344
Scientific and mechanical measuring instruments	381–82	5,681	2,484	3,196	(D)	(D)	136	1,405	276	1,129	(D)	(D)	1,933
Optical, surgical, photographic, and other instruments	384–87	4,438	92	4,346	(D)	(D)	267	689	21	668	(D)	(D)	3,411
Other manufacturing industries	27,31,39	(D)	(D)	758	(D)	(D)	147	84	0	84	(D)	(D)	527
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	30,831	6,140	24,690	$2,282	$670	1,612	6,502	2,534	3,967	$22,047	$2,935	19,112

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-25. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1994

Page 1 of 2

Distribution by industry	SIC code	Total			Basic			Applied			Development		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[Dollars in millions]											
Total		$119,595	$22,463	$97,131	$7,017	$939	$6,078	$23,490	$4,119	$19,372	$89,088	$17,405	$71,683
Food, kindred, and tobacco products	20,21	1,476	0	1,476	114	0	114	473	0	473	889	0	889
Textiles and apparel	22,23	(D)	(D)	316	(D)	(D)	42	(D)	(D)	47	(D)	(D)	228
Lumber, wood products, and furniture	24,25	(D)	(D)	201	(D)	(D)	27	(D)	(D)	43	(D)	(D)	131
Paper and allied products	26	(D)	(D)	1,263	(D)	(D)	211	(D)	(D)	619	433	0	433
Chemicals and allied products	28	(D)	(D)	16,559	2,608	9	2,599	(D)	(D)	5,386	9,186	610	8,575
Industrial chemicals	281–82,286	(D)	(D)	4,780	(D)	(D)	1,066	(D)	(D)	(D)	(D)	(D)	(D)
Drugs and medicines	283	9,633	8	9,625	(D)	1	(D)	3,333	5	3,328	(D)	2	(D)
Other chemicals	284–85,287–89	(D)	(D)	2,154	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Petroleum refining and extraction	13,29	1,950	10	1,939	(D)	0	(D)	694	5	688	(D)	5	(D)
Rubber products	30	(D)	(D)	1,432	33	0	33	(D)	(D)	215	1,184	0	1,184
Stone, clay, and glass products	32	591	38	553	50	0	50	212	37	175	329	1	328
Primary metals	33	690	17	672	(D)	(D)	102	(D)	(D)	206	(D)	(D)	364
Ferrous metals and products	331–32,3398–99	(D)	(D)	241	(D)	(D)	19	(D)	(D)	84	(D)	(D)	138
Nonferrous metals and products	333–36	(D)	(D)	431	83	0	83	(D)	(D)	122	(D)	(D)	226
Fabricated metal products	34	1,111	243	868	(D)	(D)	78	(D)	(D)	184	833	226	606
Machinery	35	8,110	99	8,011	261	7	254	1,464	35	1,429	6,385	56	6,328
Office, computing, and accounting machines	357	4,106	26	4,078	(D)	(D)	62	(D)	(D)	713	3,316	13	3,303
Other machinery, except electrical	351–56,358–59	4,004	71	3,933	(D)	(D)	192	(D)	(D)	716	3,068	43	3,025
Electrical equipment	36	15,338	1,801	13,537	(D)	(D)	388	(D)	(D)	2,597	12,203	1,653 (S)	10,550
Radio and TV receiving equipment	365	(D)	(D)	64	(D)	(D)	(D)	(D)	0	(D)	36	1	35
Communication equipment	366	(D)	(D)	4,939	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	4,111
Electronic components	367	6,032	162	5,870	(D)	(D)	121	(D)	(D)	1,370	4,529	150	4,379
Other electrical equipment	361–64,369	(D)	(D)	2,664	(D)	(D)	118	(D)	(D)	521	(D)	(D)	2,025
Transportation equipment	37	28,087	10,392	17,695	244	109	136	2,044	784 (S)	1,259	25,799	9,499	16,300
Motor vehicles and motor vehicles equipment	371	(D)	(D)	11,950	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment	373–75,379	(D)	(D)	279	31	0	31	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles	372,376	14,260	8,794	5,466	(D)	(D)	(D)	(D)	(D)	(D)	12,787	7,978	4,809

See explanatory information and SOURCE at end of table.

Table A-25. Funds for performance of basic research, applied research, and development, by industry and source of funds: 1994

Page 2 of 2

Distribution by industry	SIC code	Total			Basic			Applied			Development		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[Dollars in millions]											
Professional and scientific instruments	38	$11,441	$3,384	$8,058	(D)	(D)	$467	$2,086	$299	$1,787	(D)	(D)	$5,803
Scientific and mechanical measuring instruments	381–82	6,952	3,266	3,687	(D)	(D)	197	1,409	271	1,138	(D)	(D)	2,351
Optical, surgical, photographic, and other instruments	384–87	4,489	118	4,371	(D)	(D)	270	677	28	649	(D)	(D)	3,452
Other manufacturing industries	27,31,39	(D)	(D)	796	(D)	(D)	93	129	0	129	(D)	(D)	574
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	28,846	5,090	23,756	2,036	689	1,346	6,169	2,035	4,134	20,641	2,366 (S)	18,275

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.
N/A = Not available

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-26. Number of R&D-performing companies conducting basic research, and total number of R&D-performing companies, by industry and size of company: 1994

Page 1 of 2

Industry	SIC Code	Size of company											
		Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees		25,000 or more employees	
		Total	Basic research	Total	Basic research	Total	Basic research	Total	Basic research	Total	Basic research	Total	Basic research
Total		38,074	6,447	995	142	1,238	251	253	48	191	55	127	43
Food, kindred, and tobacco products	20,21	622	103	122	15	76	18	20	6	13	3	11	4
Textiles and apparel	22,23	194	60	34	5	57	20	7	0	9	3	1	0
Lumber, wood products, and furniture	24,25	652	311	31	8	38	8	9	1	1	0	2	0
Paper and allied products	26	617	74	10	2	36	6	10	1	9	4	5	1
Chemicals and allied products	28	1,599	496	61	12	84	28	22	10	22	12	10	6
Industrial chemicals	281–82,286	372	127	40	7	27	10	6	2	8	4	5	4
Drugs and medicines	283	346	6	8	3	27	8	6	4	9	7	4	2
Other chemicals	284–85,287–89	882	363	13	2	30	10	10	4	5	1	1	0
Petroleum refining and extraction	13,29	148	15	7	1	17	3	3	0	7	3	6	4
Rubber products	30	1,145	129	41	5	59	9	7	0	3	0	2	1
Stone, clay, and glass products	32	316	50	19	3	20	6	5	2	5	3	1	1
Primary metals	33	394	134	43	9	46	6	17	3	5	1	3	2
Ferrous metals and products	331–32,3398–99	185	53	15	7	31	5	13	3	2	0	1	1
Nonferrous metals and products	333–36	208	81	27	2	15	1	4	0	3	1	2	1
Fabricated metal products	34	1,719	546	57	7	92	13	4	0	10	1	1	1
Machinery	35	4,895	1,495	133	14	122	17	20	2	13	1	3	1
Office, computing, and accounting machines	357	461	100	20	0	25	5	5	0	2	0	1	1
Other machinery, except electrical	351–56,358–59	4,434	1,395	113	14	97	12	15	2	11	1	2	0
Electrical equipment	36	2,787	198	91	10	111	17	13	3	13	2	10	5
Radio and TV receiving equipment	365	100	11	4	0	5	3	0	0	0	0	0	0
Communication equipment	366	567	125	18	2	25	3	1	0	2	0	3	1
Electronic components	367	1,146	9	30	3	37	7	7	2	2	0	2	1
Other electrical equipment	361–64,369	975	53	39	5	44	4	5	1	9	2	5	3

See explanatory information and SOURCE at end of table.

Table A-26. Number of R&D-performing companies conducting basic research, and total number of R&D-performing companies, by industry and size of company: 1994

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Industry	SIC Code	Size of company: Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees		25,000 or more employees	
		Total	Basic research	Total	Basic research	Total	Basic research	Total	Basic research	Total	Basic research	Total	Basic research
Transportation equipment	37	782	226	66	4	61	8	17	5	11	4	14	4
Motor vehicles and motor vehicles equipment	371	284	24	54	2	36	5	10	3	6	2	4	1
Other transportation equipment	373–75,379	345	184	8	1	10	1	2	1	2	1	2	0
Aircraft and missiles	372,376	154	18	4	1	15	2	5	1	3	1	8	3
Professional and scientific instruments	38	2,204	239	69	8	63	11	10	4	3	2	8	2
Scientific and mechanical measuring instruments	381–82	1,195	16	44	6	21	4	5	1	2	1	5	1
Optical, surgical, photographic, and other instruments	383–87	1,009	223	25	2	42	7	5	3	1	1	3	1
Other manufacturing industries	27,31,39	795	158	34	3	52	18	16	1	9	3	2	1
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	19,207	2,215	178	35	304	63	73	10	58	13	48	10

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-27. Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry and size of company: 1984–95

[In thousands]

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Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Total (January)		584.1	622.5	671.0	695.8	708.6	722.5	743.6	773.4	779.3	764.7	760.5	749.2
Total (Annual average)		603.3	646.8	683.4	702.2	715.6	733.0	758.5	776.4	772.0	766.6	758.8	N/A
Distribution by industry:													
Food, kindred, and tobacco products	20,21	7.4	(S)	(S)	(S)	(S)	(S)	(S)	9.4	9.8	9.6	10.3	9.0
Textiles and apparel	22,23	2.3	2.8	2.6	2.4	2.4	2.5	2.8	(S)	2.8	3.1	3.3	3.1
Lumber, wood products, and furniture	24,25	(T)	(S)	(S)	1.3	1.3	1.4	(S)	(S)	1.5	1.6	3.3	2.3
Paper and allied products	26	6.6	6.6	6.4	6.0	6.1	6.4	8.5	(S)	10.7	10.6	10.6	10.6
Chemicals and allied products	28	69.8	71.1	75.8	75.2	75.8	78.3	80.4	81.6	85.6	86.5	93.1	91.5
Industrial chemicals	281–82,286	25.6	23.5	24.9	(S)	(S)	(S)	(S)	(S)	29.9	26.4	28.8	27.0
Drugs and medicines	283	(T)	30.8	31.8	32.6	33.0	34.4	34.3	35.4	38.7	42.3	48.5	50.3
Other chemicals	284–85,287–89	13.4	16.7	19.1	20.2	20.3	18.8	18.9	17.0	17.0	17.8	15.8	14.2
Petroleum refining and extraction	13,29	13.3	13.5	10.4	9.9	9.5	10.7	11.1	11.4	11.5	11.0	9.7	9.0
Rubber products	30	(T)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	14.8	13.0	9.0	8.8
Stone, clay, and glass products	32	5.6	6.6	7.5	8.6	8.6	7.6	7.0	6.0	5.3	5.1	4.0	4.3
Primary metals	33	8.4	7.1	5.7	5.5	5.6	5.5	5.2	4.6	5.1	4.6	5.1	6.7
Ferrous metals and products	331–32,3398–99	5.3	4.2	2.5	(S)	2.3	2.3	(S)	(S)	1.7	1.6	2.6	1.9
Nonferrous metals and products	333–36	3.1	2.9	3.2	3.4	3.3	3.3	3.3	3.0	(S)	(S)	2.5	4.8
Fabricated metal products	34	16.6	(S)	(S)	9.9	10.5	9.9	10.1	(S)	8.7	7.9	10.2	9.5
Machinery	35	87.0	81.7	89.7	95.8	98.4	100.4	113.3	109.7	99.3	97.4	70.4	66.3
Office, computing, and accounting machines	357	56.5	61.8	71.9	73.4	74.4	75.0	84.7	77.6	67.1	65.8	34.6	30.3
Other machinery, except electrical	351–56,358–59	30.5	19.9	17.8	22.4	24.0	25.4	28.6	32.1	32.2	31.6	35.8	35.9
Electrical equipment	36	113.2	113.2	117.9	130.4	132.5	122.5	105.2	95.9	91.9	89.2	96.5	105.5
Radio and TV receiving equipment	365	(T)	(S)	1.8	1.2	1.3	1.5	0.8	1.0	1.0	1.0	0.8	0.9
Communication equipment	366	59.3	62.2	65.0	71.9	73.1	58.0	47.1	35.8	31.2	(S)	36.0 (S)	43.3 (S)
Electronic components	367	(T)	29.2	(S)	43.7	44.3	42.8	(S)	32.6	28.4	28.9	40.1	41.0
Other electrical equipment	361–64,369	18.4	17.9	16.5	13.6	(S)	(S)	21.3	(S)	31.2	28.8	19.6	20.3
Transportation equipment	37	(T)	160.3	179.2	187.3	188.2	185.4	170.2	149.7	141.1	147.5	129.6	115.8
Motor vehicles and motor vehicles equipment	371	28.6	28.7	33.9	46.5	47.3	45.8	49.4	45.3	44.5	45.1	51.0	51.3
Other transportation equipment	373–75,379	(T)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	5.8 (S)	6.0 (S)
Aircraft and missiles	372,376	111.5	130.2	144.8	136.3	136.4	134.8	115.3	100.2	92.9	97.9	72.8	58.5

See explanatory information and SOURCE at end of table.

Table A-27. Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry and size of company: 1984–95

[In thousands]

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Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Distribution by industry:													
Professional and scientific instruments	38	(T)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	100.6 (S)	90.6 (S)
Scientific and mechanical measuring instruments	381–82	(T)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	66.4 (S)	69.2 (S)
Optical, surgical, photographic, and other instruments	384–87	(T)	19.8	24.0	24.6	24.9	14.5	8.1	(S)	(S)	20.8	34.2	21.4
Other manufacturing industries	27,31,39	(T)	(S)	(S)	6.3	6.4	5.4	5.6	(S)	6.0	5.8	15.5	7.7
Nonmanufacturing industries 1/	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	49.8	66.8	75.1	96.4	101.9	125.2	(S)	(S)	202.6	196.5	197.4	208.5
Distribution by size of company: [Number of employees]													
Total		584.1	622.5	671.0	696	708.6	722.5	743.6	773.4	779.3	764.7	768.5	749.2
Fewer than 500		81.9	78.3	(S)	105	109.0	105.4	(S)	(S)	142.1	125.1	148.6	137.5
500 to 999		N/A	16.5	(S)	18	19.3	18.0	18.6	18.6	46.2	46.1	27.9	30.1
1,000 to 4,999		52.6	61.6	66.7	76	81.9	76.1	75.4	79.3	94.2	99.3	108.9	110.9
5,000 to 9,999		30.1	28.5	38.9	41	40.2	47.3	57.2	55.1	57.6	56.4	60.3	62.2
10,000 to 24,999		84.0	89.9	88.4	92	94.5	87.0	73.9	90.3	99.9	102.6	90.6	91.7
25,000 or more		335.5	347.6	365.3	363	363.7	388.7	404.2	408.4	339.2	335.2	332.1	316.8

1/ Nonmanufacturing industries for 1990 and prior years included the following SICs only: 10–11, 14–17, 40–42, 44–51, 53–54, 56, 60, 62–63, 72–73, 78, 806–07, and 87.

KEY: (S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld
(T) = Data not separately available, but are included in total.
N/A = Not available

NOTE: As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-28. Cost per R&D scientist or engineer in R&D-performing companies, by industry and size of company: 1984–94

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Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Total		$124,000	$130,200	$128,500	$128,800	$132,300	$134,500	$141,300	$148,600	$157,912	$153,336	$157,601
Distribution by industry:												
Food, kindred, and tobacco products	20,21	(D)	(D)	(D)	(S)	(D)	(D)	(D)	130,000	144,215	135,261	153,609
Textiles and apparel	22,23	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Lumber, wood products, and furniture	24,25	115,400	116,300	(S)	(S)	(D)	(S)	(S)	(D)	(D)	(D)	(D)
Paper and allied products	26	(D)	(D)	(D)	(D)	(D)	(S)	(S)	(D)	(D)	(D)	(D)
Chemicals and allied products	28	112,500	116,300	117,100	125,000	139,400	149,000	159,000	167,600	183,508	(D)	(D)
Industrial chemicals	281–82,286	132,000	144,600	150,200	(S)	(S)	(S)	(S)	181,000	193,871	(D)	(D)
Drugs and medicines	283	(D)	(D)	113,600	(D)	142,800	(D)	(D)	(D)	196,631	202,607	195,145
Other chemicals	284–85,287–89	(D)	(D)	83,100	(D)	105,600	(D)	(D)	(D)	135,423	(D)	(D)
Petroleum refining and extraction	13,29	(D)	(D)	(D)	187,400	182,700	194,000	201,800	217,000	205,318	208,360	209,439
Rubber products	30	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Stone, clay, and glass products	32	(D)	(D)	118,000	122,500	(D)	(D)	(D)	(D)	(D)	137,990	141,842
Primary metals	33	(D)	(D)	(D)	131,500	118,600	(S)	(D)	142,200	114,057	138,552	116,556
Ferrous metals and products	331–32,3398–99	(D)	(D)	(D)	(D)	(S)	(D)	(D)	(D)	(D)	138,851	(D)
Nonferrous metals and products	333–36	112,000	136,400	138,800	(D)	(S)	(D)	(D)	(D)	(D)	138,326 (S)	(D)
Fabricated metal products	34	111,600	112,900	(S)	76,600	88,100	(S)	(S)	115,500	123,828	129,131	113,168
Machinery	35	124,500	142,500	(D)	(D)	(D)	130,000	138,500	147,800	152,797	100,631	118,717
Office, computing, and accounting machines	357	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	99,564	126,476
Other machinery, except electrical	351–56,358–59	(D)	(D)	119,200	98,300	99,400	(D)	(D)	(D)	(D)	102,213	111,691
Electrical equipment	36	121,700	124,900	120,700	124,300	124,100	132,400	142,800	147,100	150,118	144,725	151,872
Radio and TV receiving equipment	365	(D)	(D)	88,700	97,900	124,200	103,400	113,200	(D)	(D)	(D)	(D)
Communication equipment	366	143,000	147,800	141,300	155,300	160,300	170,600	177,100	(S)	(D)	(D)	(D)
Electronic components	367	100,500	114,100	(D)	98,400	(S)	(S)	128,400	(D)	127,801	154,366	148,761
Other electrical equipment	361–64,369	(D)	(D)	(D)	(S)	68,500	(S)	(S)	(D)	(D)	(D)	(D)
Transportation equipment	37	(D)	(D)	170,700	183,400	195,600	211,700	215,700	189,400	191,274	196,777	228,881
Motor vehicles and motor vehicles equipment	371	211,400	223,100	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment	373–75,379	(D)	(D)	(S)	(S)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles	372,376	156,000	161,700	149,800	180,400	193,300	207,300	213,700	177,000	180,552	176,450	217,219

See explanatory information and SOURCE at end of table.

Table A-28. Cost per R&D scientist or engineer in R&D-performing companies, by industry and size of company: 1984–94

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Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Professional and scientific instruments	38	$116,900	$122,000	(S)	(S)	(S)	(S)	(S)	(S)	(S)	$115,180 (S)	$119,693 (S)
Scientific and mechanical measuring instruments	381–82	(D)	(D)	(D)	(D)	(S)	(S)	(S)	(S)	(S)	94,036 (S)	102,570 (S)
Optical, surgical, photographic, and other instruments	384–87	(D)	(D)	(D)	(D)	316,700	(S)	(S)	(S)	(S)	161,721	161,435
Other manufacturing industries	27,31,39	(D)	(D)	(S)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Nonmanufacturing industries 1/	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	84,100	94,600	86,800	69,100	74,900	(S)	(S)	137,400	152,411	159,188	142,125
Distribution by size of company: [Number of employees]												
Total		124000	130200	128500	128800	132300	134500	141300	148600	157912	153336	157601
Fewer than 500		55,000	(S)	70,600	66,800	67,100	66,200	(S)	103,400	111,358	106,888	85,793
500 to 999		87,200	(S)	103,400	92,600	(S)	98,200	(S)	178,700	176,585	87,233	138,366
1,000 to 4,999		96,700	97,300	106,400	91,900	100,600	101,900	91,400	119,400	127,135	128,565	139,693
5,000 to 9,999		111,000	119,300	108,400	102,900	100,400	102,500	110,800	150,800	148,285	156,899	152,227
10,000 to 24,999		130,500	124,600	122,300	132,700	143,000	127,300	135,300	167,300	156,190	160,229	182,243
25,000 or more		143,000	155,300	154,300	157,700	160,700	168,200	193,700	180,100	182,839	184,804	195,890

1/ Nonmanufacturing industries for 1990 and prior years included the following SICs only: 10–11, 14–17, 40–42, 44–51, 53–54, 56, 60, 62–63, 72–73, 78, 806–07, and 87.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

NOTES: The number of full-time-equivalent R&D scientists and engineers used to estimate the cost per R&D scientist or engineer is the arithmetic mean of the numbers of R&D scientists and engineers reported for January in two consecutive years. This number is then divided into the total R&D expenditures of the earlier years, and the ratio is attributed to the earlier year.

As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-29. Cost per R&D scientist or engineer in R&D-performing companies, by industry and size of company: 1994

Page 1 of 2

Industry	SIC code	Total	Size of company: Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
Total		$157,601	$85,793	$138,366	$139,693	$152,227	$182,243	$195,890
Food, kindred, and tobacco products	20,21	153,609	56,201	173,792	140,234	146,931 (S)	146,494	209,273
Textiles and apparel	22,23	(D)	70,026	155,469	108,859	298,833	122,060 (S)	(D)
Lumber, wood products, and furniture	24,25	(D)	33,659	96,377	90,873	121,163	(D)	(D)
Paper and allied products	26	(D)	61,053 (S)	108,649	168,244	235,370 (S)	116,529 (S)	(D)
Chemicals and allied products	28	(D)	75,623	126,660	177,233	164,839	208,158	240,018
Industrial chemicals	281–82,286	(D)	50,150	134,397	152,773	131,682	263,244 (S)	295,013
Drugs and medicines	283	195,145	84,107	155,449	225,970	196,118	206,729	202,790 (S)
Other chemicals	284–85,287–89	(D)	46,844	103,222	119,223	154,085 (S)	201,107	(D)
Petroleum refining and extraction	13,29	209,439	66,033	(D)	188,659 (S)	(D)	216,429 (S)	223,159
Rubber products	30	(D)	176,887	217,631	158,128 (S)	122,665 (S)	(D)	(D)
Stone, clay, and glass products	32	141,842	112,796	98,596 (S)	131,341	144,792 (S)	142,306	(D)
Primary metals	33	116,556	59,259	77,854	123,194 (S)	194,481	157,787	(D)
Ferrous metals and products	331–32,3398–99	(D)	36,588	86,415 (S)	102,022	146,732	(D)	(D)
Nonferrous metals and products	333–36	(D)	67,739	76,967	153,447 (S)	(D)	(D)	(D)
Fabricated metal products	34	113,168	63,653	119,913	128,715	(D)	143,729 (S)	(D)
Machinery	35	118,717	70,018	123,944	130,944	133,028	229,136	(D)
Office, computing, and accounting machines	357	126,476	69,037	120,922	149,896	133,512	(D) (D)	(D)
Other machinery, except electrical	351–56,358–59	111,691	69,515	125,951	112,492	131,936	210,755	(D)
Electrical equipment	36	151,872	87,997	147,576	126,118	233,652	171,974 (S)	172,118 (S)
Radio and TV receiving equipment	365	(D)	53,895	(D)	93,693 (S)	0	0	0
Communication equipment	366	(D)	99,034	117,181	111,222	(D)	(D)	(D)
Electronic components	367	148,761	79,235	160,552	190,522	237,894	(D)	(D)
Other electrical equipment	361–64,369	(D)	63,334	171,356	118,387	143,234	147,780	(D)
Transportation equipment	37	228,881	(D)	157,427	161,249	106,104 (S)	187,198 (S)	257,701
Motor vehicles and motor vehicles equipment	371	(D)	23,066	156,355	137,098	131,406	123,565 (S)	(D)
Other transportation equipment	373–75,379	(D)	75,701	227,210	136,013 (S)	(D)	(D)	[illegible]
Aircraft and missiles	372,376	217,219	5,274	(D)	185,395	122,871 (S)	(D)	252,26

See explanatory information and SOURCE at end of table.

Table A-29. Cost per R&D scientist or engineer in R&D-performing companies, by industry and size of company: 1994

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Industry	SIC code	Total	Size of company					
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
Professional and scientific instruments	38	$119,693 (S)	$69,740	$127,739	$132,424	$194,181	$145,439	$127,251 (S)
Scientific and mechanical measuring instruments	381–82	102,570 (S)	91,367	126,625	113,882	140,717	(D)	98,854 (S)
Optical, surgical, photographic, and other instruments	384–87	161,435	55,910	134,452	153,872	247,736	(D)	320,238 (S)
Other manufacturing industries	27,31,39	(D)	34,744	111,151	102,035	88,297 (S)	152,633 (S)	(D)
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	142,125	116,669	141,062	127,651	143,855	130,688	178,137

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Indicates imputation of more than 50 percent. For years prior to 1993, data have been withheld.

NOTES: The number of full-time-equivalent R&D scientists and engineers used to estimate the cost per R&D scientist or engineer is the arithmetic mean of the numbers of R&D scientists and engineers reported for January in two consecutive years. This number is then divided into the total R&D expenditures of the earlier years, and the ratio is attributed to the earlier year.

As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table A-30. Domestic employment of R&D-performing companies, by industry and size of company: 1993–94

Page 1 of 3

Industry	SIC code	Total	Size of company					
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		1993						
Total		16,585	1,783	621	2,639	1,630	2,845	7,068
Food, kindred, and tobacco products	20,21	1,081	70	39	176	142	170	485
Textiles and apparel	22,23	463	48	(D)	127	52	135	(D)
Lumber, wood products, and furniture	24,25	300	53	27	77	55	(D)	(D)
Paper and allied products	26	562	28	23	73	53	153	232
Chemicals and allied products	28	1,196	110	39	182	135	342	387
Industrial chemicals	281–82,286	512	15	11	64	59	128	234
Drugs and medicines	283	351	27	8	62	25	(D)	(D)
Other chemicals	284–85,287–89	333	68	20	56	51	(D)	(D)
Petroleum refining and extraction	13,29	385	8	4	32	21	116	204
Rubber products	30	378	100	40	103	(D)	(D)	(D)
Stone, clay, and glass products	32	245	34	(D)	46	38	80	(D)
Primary metals	33	452	38	(D)	118	95	109	(D)
Ferrous metals and products	331–32,3398–99	283	19	(D)	87	75	48	(D)
Nonferrous metals and products	333–36	169	20	(D)	30	20	61	(D)
Fabricated metal products	34	604	116	46	163	(D)	205	(D)
Machinery	35	1,145	240	87	276	171	157	213
Office, computing, and accounting machines	357	281	33	14	61	72	(D)	(D)
Other machinery, except electrical	351–56,358–59	864	207	73	216	99	(D)	(D)
Electrical equipment	36	1,267	153	64	241	56	161	592
Radio and TV receiving equipment	365	16	(D)	(D)	10	0	0	0
Communication equipment	366	276	(D)	10	47	0	(D)	(D)
Electronic components	367	333	56	24	86	(D)	(D)	(D)
Other electrical equipment	361–64,369	643	58	(D)	98	(D)	101	343
Transportation equipment	37	1,830	46	31	126	124	167	1,336
Motor vehicles and motor vehicles equipment	371	948	24	7	85	66	(D)	(D)
Other transportation equipment	373–75,379	102	14	6	10	21	(D)	(D)
Aircraft and missiles	372,376	781	8	18	31	37	85	601

See explanatory information and SOURCE at end of table.

Table A-30. Domestic employment of R&D-performing companies, by industry and size of company: 1993–94

Page 2 of 3

Industry	SIC code	Total	Size of company					
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		1993						
Professional and scientific instruments	38	738	107	51	146	42	75	316
Scientific and mechanical measuring instruments	381–82	382	51	29	62	(D)	(D)	168
Optical, surgical, photographic, and other instruments	384–87	356	56	22	85	(D)	(D)	149
Other manufacturing industries	27,31,39	493	113	(D)	92	79	120	(D)
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	5,448	517	91	662	482	829	2,868
		1994						
Total		17,443	2,316	706	2,756	1,748	2,989	6,929
Food, kindred, and tobacco products	20,21	1,103	46	85	180	140	180	472
Textiles and apparel	22,23	446	31	(D)	137	47	155	(D)
Lumber, wood products, and furniture	24,25	337	42	22	82	61	(D)	(D)
Paper and allied products	26	696	170	8	79	72	165	203
Chemicals and allied products	28	1,225	105	46	183	143	341	407
Industrial chemicals	281–82,286	548	40	30	58	41	125	254
Drugs and medicines	283	382	28	(D)	61	38	136	(D)
Other chemicals	284–85,287–89	295	37	(D)	64	64	80	(D)
Petroleum refining and extraction	13,29	376	8	5	40	21	112	190
Rubber products	30	456	154	(D)	113	43	38	(D)
Stone, clay, and glass products	32	221	17	13	43	34	(D)	(D)
Primary metals	33	482	44	34	109	117	81	98
Ferrous metals and products	331–32,3398–99	279	24	12	76	88	(D)	(D)
Nonferrous metals and products	333–36	204	20	22	33	29	(D)	(D)

See explanatory information and SOURCE at end of table.

Table A-30. Domestic employment of R&D-performing companies, by industry and size of company: 1993–94

Page 3 of 3

Industry	SIC code	Total	Size of company					
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
		1994						
Fabricated metal products	34	612	186	39	183	(D)	146	(D)
Machinery	35	1,143	315	99	275	146	197	111
Office, computing, and accounting machines	357	201	30	15	62	39	(D)	(D)
Other machinery, except electrical	351–56,358–59	942	285	84	213	108	(D)	(D)
Electrical equipment	36	1,433	241	63	237	82	222	587
Radio and TV receiving equipment	365	21	7	3	12	0	0	0
Communication equipment	366	312	45	12	53	(D)	(D)	(D)
Electronic components	367	383	107	22	79	(D)	(D)	(D)
Other electrical equipment	361–64,369	717	82	27	93	28	148	340
Transportation equipment	37	1,812	51	42	144	121	161	1,293
Motor vehicles and motor vehicles equipment	371	1,032	18	34	85	(D)	(D)	(D)
Other transportation equipment	373–75,379	148	20	6	20	(D)	(D)	(D)
Aircraft and missiles	372,376	632	12	3	39	35	52	492
Professional and scientific instruments	38	791	159	49	144	67	40	333
Scientific and mechanical measuring instruments	381–82	414	64	(D)	49	32	(D)	210
Optical, surgical, photographic, and other instruments	384–87	377	96	(D)	95	35	(D)	123
Other manufacturing industries	27,31,39	544	90	(D)	108	105	156	(D)
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	5,765	657	124	699	517	908	2,858

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

NOTES: Rankings were based on total (company, Federal, and other) R&D funds.

As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

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SURVEY METHODOLOGY[1]

REPORTING UNIT

The reporting unit for the Survey of Industrial Research and Development is the enterprise, or company, defined as a business organization of one or more establishments under common ownership or control. The survey includes two groups of enterprises: (1) companies known to conduct R&D and (2) a sample representation of companies for which information on the extent of R&D activity is uncertain.

FRAME CREATION

The Standard Statistical Establishment List (SSEL), a Bureau of the Census compilation that contains information on more than 3 million establishments with paid employees, was the target population from which the frame used to select the 1994 survey sample was created (see table B-1 for target population and sample sizes). For companies with more than one establishment, data were summed to the company level. The firm was then assigned a single standard industrial classification (SIC) code based on the activity of the establishment(s) having the highest dollar value of payroll. This assignment was done on a hierarchical basis. The enterprise was first assigned to the economic division (manufacturing or nonmanufacturing) with the highest payroll, then to the two-digit SIC code with the highest payroll within the assigned division, then to the three-digit SIC code with the highest payroll within the assigned two-digit industry.

The frame from which the survey sample was drawn included all for-profit companies classified in nonfarm industries. For surveys prior to 1992, the frame was limited to companies above certain size criteria based on number of employees.[2] These criteria varied by industry. Also, some industries were excluded from the frame because it was believed that these industries contributed little or no R&D activity to the final survey estimates. For the 1992 sample, new industries were added to the frame[3] and the size criteria were lowered considerably and applied uniformly to firms in all industries. As a result, nearly 2 million enterprises with five or more employees were given a chance of selection. For comparison, the frame for the 1987 sample included 154,000 companies of specified sizes and industries. The initial frame used to select the 1994 sample was similar to the ones used to select the 1992 and 1993 samples.

The frame ultimately used to select the 1994 sample differed from the 1993 frame in the following respects. First, the predetermination of companies selected for the survey with certainty was limited to companies with reported or estimated R&D expenditures of $1 million or more and all companies with 1,000 employees or more. For the 1993 frame, external information about the likelihood that a company conducted R&D was used to identify nearly 10,000 companies that were included in the survey sample with certainty. Sources included the 1992 survey, directories that include company information on R&D reported to the Securities and Exchange Commission, commercially available directories of R&D-performing companies, Department of Defense directories of contracts awarded for R&D, and various publications and newsletters that highlight firms conducting R&D. In the 1994 frame, these companies were included along with R&D spending reported in the 1993 survey. Their likelihood of selection in the 1994 sample was based on the level of their R&D programs reported in 1993 rather than with certainty.

Other modifications to the 1993 frame for the 1994 survey were the partitioning of the frame and the expanded use of simple random sampling. Since the early 1980's, probability proportionate to size (pps) sampling had been used exclusively in the selection of new sample panels for the R&D survey. An examination of 1992 survey results, however, showed that the large influx of small companies into the frame that year resulted in a disproportionate number of small companies being selected for the sample, often with very

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[1] Information for this section was provided by the Manufacturing and Construction Division of the Bureau of the Census, the collecting and compiling agent for the National Science Foundation. Copies of the technical papers cited can be obtained by contracting NSF's Research and Development Statistics Program in the Division of Science Resources Studies at the address given in General Notes, preceding section A.

[2] See the Bureau of the Census technical memorandum entitled Evaluation of Total Employment Cut-Offs in the Survey of Industrial Research and Development, Nov 3, 1994.

[3] These industries are listed and discussed under Comparability of Statistics, later in this section.

Table B-1. Number of companies in the target population and sample: 1994

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Industry	SIC code	Companies in target population	1994 survey			Companies reporting R&D expenditures for 1994 3/		Companies reporting no R&D expenditures
			Companies selected for 1994 sample	Non-certainties 1/	Certainties 2/	Greater than or equal to	Less than $1 million	
Total		1,857,050	23,541	14,100	9,441	2,787	2,096	15,355
MANUFACTURING								
Total		197,042	13,191	8,167	5,024	2,110	1,742	7,568
Distribution by industry:								
Food, kindred, and tobacco products	20,21	10,203	489	210	279	87	106	233
Textiles and apparel	22,23	16,351	1,111	743	368	55	97	689
Lumber, wood products, and furniture	24,25	23,433	2,573	2,026	547	32	167	1,955
Paper and allied products	26	3,278	226	123	103	54	34	119
Chemicals and allied products	28	5,053	434	163	271	246	68	88
Industrial chemicals	281–82,286	873	143	57	86	80	23	27
Drugs and medicines	283	764	125	39	86	84	17	16
Other chemicals	284–85,287–89	3,416	166	67	99	82	28	45
Oil and Gas Extraction	13	5,543	288	212	76	13	10	230
Petroleum refining and related industries	29	600	193	99	94	19	33	114
Rubber products	30	9,066	271	130	141	89	58	93
Stone, clay, and glass products	32	7,265	612	385	227	38	69	408
Primary metals	33	3,694	548	315	233	67	96	320
Ferrous metals and products	331–32,3398–99	1,856	271	159	112	34	56	154
Nonferrous metals and products	333–36	1,838	277	156	121	33	40	166
Fabricated metal products	34	21,749	1,818	1,206	612	125	357	1,099
Machinery	35	30,443	1,014	559	455	383	198	349
Office, computing, and accounting machines	357	1,222	159	25	134	124	15	11
Other machinery, except electrical	351–56,358–59	29,221	855	534	321	259	183	338
Electrical equipment	36	9,328	793	285	508	408	133	187
Radio and TV receiving equipment	365	384	88	38	50	14	24	37
Communication equipment	366	1,120	162	26	136	126	21	10
Electronic components	367	3,831	207	40	167	146	14	36
Other electrical equipment	361–64,369	3,993	336	181	155	122	74	104

See explanatory information and SOURCE at end of table.

Table B-1. Number of companies in the target population and sample: 1994

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Industry	SIC code	Companies in target population	1994 survey			Companies reporting R&D expenditures for 1994 3/		Companies reporting no R&D expenditures
			Companies selected for 1994 sample	Non-certainties 1/	Certainties 2/	Greater than or equal to	Less than $1 million	
Transportation equipment	37	5,674	479	230	249	102	92	232
Motor vehicles and motor vehicles equipment	371	2,573	182	103	79	52	25	85
Other transportation equipment	373–75,379	2,146	178	52	126	18	49	93
Aircraft and missiles	372,376	955	119	75	44	32	18	54
Professional and scientific instruments	38	5,979	462	129	333	309	50	71
Scientific and mechanical measuring instruments	381–82	2,972	221	53	168	160	19	29
Optical, surgical, photographic, and other instruments	384–87	3,007	241	76	165	149	31	42
Other manufacturing industries	27,31,39	39,383	1,880	1,352	528	83	174	1,381
NONMANUFACTURING								
Total		1,660,008	10,350	5,933	4,417	677	354	7,787
Communication services	48	7,875	180	122	58	19	4	128
Electric, gas, and sanitary services	49	3,006	224	77	147	45	46	113
Computer programming, data processing, other computer-related engineering, architectural, and surveying services	737,871	39,093	509	234	275	190	45	220
Hospitals and medical and dental laboratories	806–07	5,441	153	64	89	14	5	108
Research, development, and testing services	873	5,215	149	20	129	117	5	22
Other nonmanufacturing industries	07–10, 12–17, 40–42, 44–47, 50–59, 60–65, 67, 701, 73 (except 737), 75–76, 78–79, 78–79, 80–81, (except 806 and 807), 83–84, 87 (except 871 and) 873), 89	1,599,378	9,135	5,416	3,719	292	249	7,196

1/ Noncertainties are companies whose probability of selection is less than one.

2/ Certainties are companies whose probability of selection is one. This includes companies whose 1993 R&D expenditures are equal to or greater than $1 million.

3/ This includes RD-1S companies for which total R&D expenditure data were imputed.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

large weights. These companies generally reported little, if any, R&D activity. This disproportion was caused primarily by the application of the minimum probability rule (see below under "Sample Size and Weighting") which resulted in increased probabilities of selection for several hundred thousands of these smaller companies.

As a result, the 1994 frame was split into "large" and "small" company partitions. Probability proportionate to size (pps) sampling continued to be used for the large partition. However, more efficient simple random sampling (SRS) was used to sample the small company partition. Simple random sampling is more efficient than independent pps sampling when little variability exists in the size of the variable being measured.

Payroll was the basis for determining the partition between large and small, and the analysis of payroll was performed for each of the 165 defined sampling strata. Within each stratum, companies were sorted by payroll. Companies previously designated as certainties were defined as large regardless of their payroll (that is, all predetermined certainties were included in the pps frame). With that parameter, cumulative payroll values were computed until 90 percent of the stratum total was reached. Companies contributing to the 90 percent share were defined as large, and the remaining companies were defined as small. In total, the large partition contained about 640,000 companies. The small partition contained about 1.2 million companies. An additional benefit of these design changes was a reduction in the maximum allowable weight for selected companies.

SAMPLE SELECTION

PROBABILITY PROPORTIONATE TO SIZE

The distribution of companies by payroll and estimated R&D in the large partition was skewed as in earlier frames. Because of this skewness, pps sampling used in previous designs was an appropriate selection technique for this group. That is, large companies had a higher probability of selection than did small companies. For this survey it would have been ideal if company size could have been determined by its R&D expenditures. Unfortunately, except for the companies that were in a previous survey or for which there was information from external sources, it was impossible to know the R&D expenditures for every firm in the universe. Consequently, the probability of selection for most companies was based on estimated R&D expenditures.

Since total employment was known for each company in the universe, it was possible to use an already-observed relationship between employment and R&D to estimate an amount for R&D expenditures to use as a measure of size. This was the same strategy employed in all sampling operations since 1981. For 1994 sampling, data collected in the 1993 survey were used to derive this relationship separately for single-unit companies and multiestablishment companies. The effect in all cases was to give firms with a large number of employees higher probabilities of selection since the assumption was that large companies were more likely to perform R&D and that the amount of R&D was proportionate to the size of the company.

Estimated R&D values were computed for companies in the small partition as well. The aggregate of reported and estimated R&D from each company in both the large and small partitions represented a total universe measure of R&D expenditures. However, assigning R&D to every company resulted in an overstatement of this measure. To adjust for the overstatement, the universe measure was scaled down using factors developed from the relationship of the universe measure of 1993 R&D and the 1993 survey estimate. These factors, computed at levels corresponding to published industry levels, were used to adjust originally imputed R&D values so that the new frame total for R&D at these levels approximated the 1993 published values. This adjustment provided for better allocation of the sample among these levels.

SIMPLE RANDOM SAMPLING

In the small company partition, the use of simple random sampling implied that each company within a stratum had an equal probability of selection. Stratum definitions were the same as for the large partition. The total sample allocated to the small partition was dependent upon the total sample specified for the survey and upon the total sample necessary to satisfy criteria established for the large partition. Once determined, the allocation of this total by stratum was made proportionate to the stratum's payroll contribution to the entire partition.

SAMPLE STRATIFICATION AND RELATIVE STANDARD ERROR CONSTRAINTS

The particular sample selected was one of a large number of the same type and size that by chance might have been selected. Statistics resulting from the different samples would differ somewhat from each other. These differences are represented by estimates of sampling error. The smaller the sampling error, the more precise the statistic.

Primary concern was placed on the large company partition since it was believed that nearly all of the R&D activity would be identified from this sector. To control sampling error in the statistics resulting from this portion of the frame, parameters were specified to allocate the sample across various levels, or strata, that corresponded to industry groupings. These parameters permitted the sample size to be varied to achieve a desired level of sampling error for each stratum and were assigned so that estimated errors of total R&D expenditures for industries in these strata did not exceed certain levels. Sample sizes among the strata were only constrained by the limit placed on the total sample size dictated by the available budget.

For sample selections prior to 1992, the stratum designations were the published industry categories. The sample was allocated across these industry categories to provide high, medium, and low levels of precision. For the 1992 sample the criteria for this allocation were modified. In order to gather information to review and evaluate the appropriateness of the published industry groupings, the allocation of the sample was controlled for levels of industry detail below those traditionally published. The result was that the frame was partitioned into 140 manufacturing industry strata and 25 nonmanufacturing strata. The manufacturing strata corresponded to the 140 three-digit industries that comprised manufacturing. For nonmanufacturing, 12 strata corresponded to three-digit nonmanufacturing industries that represented a current level of publication or that had a high concentration of scientists and engineers, and 12 strata corresponded to two-digit nonmanufacturing industries where R&D activity was considered likely. These nonmanufacturing strata thus identified newly emerging industries or industries where improved coverage was desired. The final stratum was the balance of nonmanufacturing industries that had not been included in previous sampling frames or for which there was little indication of R&D activity. This same stratification was used for the 1993 and 1994 samples.

For 1994, the following criteria for the relative standard error of estimated R&D expenditures were established for the 165 strata of the large company partition:

a. Relative sampling error not to exceed 2 percent: all 140 three-digit manufacturing strata, 12 three-digit nonmanufacturing strata, and 3 two-digit nonmanufacturing strata.

b. Relative sampling error not to exceed 5 percent: the remaining 9 two-digit nonmanufacturing strata, and the 1 stratum corresponding to the balance of nonmanufacturing.

These criteria, which differed from the criteria established for the 1993 survey, suggested a total sample size of approximately 17,600 companies from the large partition.

A limitation of the sample allocation process for the large partition should be noted. The sampling errors used to control the sample size in each stratum were based on a universe total that, in large part, was improvised. That is, as previously noted, an R&D value was assigned to every company in the frame, even though many of these companies actually may not have had R&D expenditures. The value assigned was imputed for the majority of companies in the frame and, as a consequence, the estimated universe total and the distribution of individual company values did not necessarily reflect the true distribution. Estimates of sampling variability were nevertheless based on this distribution. The presumption was that actual variation in the sample design would be less than that estimated, because many of the sampled companies have true R&D values of zero, not the widely varying values that were imputed using total employment as a predictor of R&D. Previous sample selections indicate that in general this presumption holds, but exceptions have occurred when companies with large sampling weights have reported large amounts of R&D spending. Thus, in general, the 2-percent and 5-percent error levels described earlier are conservative. See table B-2 for a list by industry of the actual standard error estimates for selected items.

For the small partition, the same 165 strata were identified. Also included was a separate stratum of approximately 8,700 companies that could not be assigned to a stratum because of incomplete industry

Table B-2. Relative standard error of estimate (percentage) for selected items, by industry and size of company: 1994

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Industry	SIC code	Number of R&D-performing companies	Domestic net sales of R&D performers	Domestic employment of R&D performers	Number of FTE scientists and engineers	Total R&D	Company and other funds for R&D
Total		4,883	0.9	1.4	2.3	1.4	1.7
Food, kindred, and tobacco products	20,21	193	1.8	3.8	4.1	2.4	2.4
Textiles and apparel	22,23	152	3.1	2.1	4.3	2.3	2.4
Lumber, wood products, and furniture	24,25	199	2.0	2.1	2.6	2.9	3.0
Paper and allied products	26	88	10.3	22.0	2.2	1.2	1.2
Chemicals and allied products	28	314	2.0	1.7	0.7	0.9	1.0
Industrial chemicals	281–82,286	103	4.1	3.1	1.6	0.8	1.0
Drugs and medicines	283	101	0.9	2.0	0.8	1.5	1.5
Other chemicals	284–85,287–89	110	3.1	3.1	2.3	0.9	0.9
Petroleum refining and extraction	13,29	75	0.3	0.7	0.8	0.4	0.4
Rubber products	30	147	14.1	16.9	15.2	16.7	17.5
Stone, clay, and glass products	32	107	0.9	1.2	6.5	7.8	2.8
Primary metals	33	163	5.2	3.9	22.6	9.2	9.4
Ferrous metals and products	331–32,3398–99	90	2.9	3.3	3.6	2.4	2.5
Nonferrous metals and products	333–36	73	12.2	8.2	31.5	14.3	14.6
Fabricated metal products	34	482	5.3	5.3	4.4	2.7	3.4
Machinery	35	581	7.1	3.2	3.2	2.3	2.2
Office, computing, and accounting machines	357	139	6.8	3.6	1.8	1.3	1.3
Other machinery, except electrical	351–56,358–59	442	9.1	3.7	5.6	4.4	4.4
Electrical equipment	36	541	2.3	4.8	1.8	1.1	1.3
Radio and TV receiving equipment	365	38	7.2	5.1	11.2	6.2	6.2
Communication equipment	366	147	2.4	3.0	1.9	1.2	1.4
Electronic components	367	160	6.5	17.2	4.0	2.5	2.6
Other electrical equipment	361–64,369	196	2.0	2.4	2.9	1.5	1.8
Transportation equipment	37	194	0.7	1.3	0.6	0.2	0.3
Motor vehicles and motor vehicles equipment	371	77	1.0	2.0	1.3	0.3	0.3
Other transportation equipment	373–75,379	67	3.9	5.8	2.2	2.1	5.0
Aircraft and missiles	372,376	50	0.4	0.8	0.2	0.1	0.3

See explanatory information and SOURCE at end of table.

Table B-2. Relative standard error of estimate (percentage) for selected items, by industry and size of company: 1994

Page 2 of 4

Industry	SIC code	Number of R&D-performing companies	Domestic net sales of R&D performers	Domestic employment of R&D performers	Number of FTE scientists and engineers	Total R&D	Company and other funds for R&D
Professional and scientific instruments	38	359	4.1	4.8	2.4	2.8	3.9
Scientific and mechanical measuring instruments	381–82	179	3.2	5.3	2.2	2.5	4.4
Optical, surgical, photographic, and other instruments	384–87	180	7.8	8.3	7.3	6.0	6.2
Other manufacturing industries	27,31,39	257	2.6	3.6	5.8	7.6	7.6
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–85, 87, 89	1,031	1.9	2.4	8.1	5.6	6.6
Distribution by size of company: (Based on number of employees)							
Total		4,883	0.9	1.4	2.3	1.4	1.7
Fewer than 500		2,454	9.3	10.2	12.6	12.1	12.9
500 to 999		645	7.8	7.9	4.8	2.3	1.7
1,000 to 4,999		1,213	0.5	0.9	0.2	0.2	0.2
5,000 to 9,999		253	0.0	0.0	0.0	0.0	0.0
10,000 to 24,999		191	0.1	0.2	0.0	0.0	0.0
25,000 or more		127	0.0	0.0	0.0	0.0	0.0

See explanatory information and SOURCE at end of table.

Table B-2. Relative standard error of estimate (percentage) for selected items, by industry and size of company: 1994

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Industry	SIC code	Comp.-financed R&D performed outside of U.S.	Comp.-financed R&D contracted to outside organizations	Federal funds for R&D	Total funds for basic research	Total funds for applied research	Total funds for development
Total		1.6	3.6	1.6	9.5	1.9	1.8
Food, kindred, and tobacco products	20,21	0.2	2.3	0.0	7.5	5.2	2.7
Textiles and apparel	22,23	17.1	46.5	0.0	2.6	6.6	4.2
Lumber, wood products, and furniture	24,25	6.8	1.8	0.5	10.9	2.9	3.6
Paper and allied products	26	0.0	2.0	0.0	0.3	0.3	4.1
Chemicals and allied products	28	0.5	0.5	0.3	1.0	2.3	0.5
Industrial chemicals	281–82,286	4.0	14.7	0.0	2.4	0.7	0.8
Drugs and medicines	283	0.2	0.3	42.3	0.0	4.2	0.8
Other chemicals	284–85,287–89	0.0	1.5	0.0	4.6	0.5	1.4
Petroleum refining and extraction	13,29	0.0	0.2	0.0	0.1	0.9	0.3
Rubber products	30	3.9	1.5	0.0	8.7	2.4	16.8
Stone, clay, and glass products	32	0.0	21.3	80.7	1.9	17.0	4.1
Primary metals	33	0.0	0.1	0.3	62.6	2.5	5.0
Ferrous metals and products	331–32,3398–99	0.0	0.0	0.9	19.2	0.8	2.9
Nonferrous metals and products	333–36	0.0	0.3	0.0	76.9	4.1	8.1
Fabricated metal products	34	3.4	13.9	0.9	5.3	4.6	3.4
Machinery	35	1.9	30.7	14.8	10.6	5.2	2.5
Office, computing, and accounting machines	357	0.0	53.4	10.9	2.1	3.9	1.2
Other machinery, except electrical	351–56,358–59	2.6	15.7	20.1	14.5	10.0	5.2
Electrical equipment	36	0.4	16.8	0.1	5.1	4.7	1.2
Radio and TV receiving equipment	365	74.9	37.5	0.0	1.4	20.8	11.1
Communication equipment	366	0.0	51.8	0.0	17.2	2.7	2.2
Electronic components	367	0.0	0.0	0.0	0.0	9.4	2.2
Other electrical equipment	361–64,369	0.0	4.0	0.5	5.6	2.2	1.5
Transportation equipment	37	0.0	1.2	0.0	1.8	1.4	0.1
Motor vehicles and motor vehicles equipment	371	0.0	0.5	0.0	0.4	4.1	0.1
Other transportation equipment	373–75,379	0.0	29.7	0.0	15.4	2.0	2.5
Aircraft and missiles	372,376	0.0	7.9	0.0	0.3	0.5	0.1

See explanatory information and SOURCE at end of table.

Table B-2. Relative standard error of estimate (percentage) for selected items, by industry and size of company: 1994

Page 4 of 4

Industry	SIC code	Comp.-financed R&D performed outside of U.S.	Comp.-financed R&D contracted to outside organizations	Federal funds for R&D	Total funds for basic research	Total funds for applied research	Total funds for development
Professional and scientific instruments	38	16.1	6.1	1.6	1.8	3.8	3.3
Scientific and mechanical measuring instruments	381–82	0.0	5.4	1.7	0.0	0.5	3.6
Optical, surgical, photographic, and other instruments	384–87	18.6	8.4	0.0	3.8	11.8	6.3
Other manufacturing industries	27,31,39	0.1	15.5	1.0	22.2	28.8	7.1
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–85, 87, 89	0.0	10.3	6.8	25.4	6.0	7.3
Distribution by size of company: (Based on number of employees)							
Total		1.6	3.6	1.6	9.5	1.9	1.8
Fewer than 500		43.4	22.5	29.9	38.3	12.8	17.8
500 to 999		1.3	1.0	26.9	4.6	3.2	2.8
1,000 to 4,999		0.0	0.1	0.0	0.1	0.1	0.2
5,000 to 9,999		0.0	0.0	0.0	0.0	0.0	0.0
10,000 to 24,999		0.0	0.0	0.0	0.0	0.0	0.0
25,000 or more		0.0	0.0	0.0	0.0	0.0	0.0

NOTE: A description of the standard error of estimate is given in section A under "Methodology of Survey." The percentage (or relative) standard errors in this table may be converted to standard errors of estimate by multiplying the percentages shown by the associated estimates. For example, the relative standard error of estimate for R&D performance for all company size groups in the machinery industry (SIC 35) is shown as 2.3 percent, and the associated total R&D estimate for this industry is shown as $8,110 million in table A–3, "Total (company and Federal) funds for industrial R&D performance by industry and size of company: 1984–94." The standard error of estimate, then, is .023 times 8,110 or 187.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

identification in the Standard Statistical Establishment List (SSEL). In 1994, for the first time, a small number of companies was selected from this group in the hopes that an accurate industry identification could be obtained at a later point. The initial sample size specified for the small company partition was 4,500 companies. The sample initially allocated to a given stratum was proportionate to its share of total payroll for the small partition.

In addition to sampling error, the estimates are subject to nonsampling error. Errors are grouped into five categories: specification, coverage, response, nonresponse, and processing. For detailed discussions on the sources, control, and measurement of each of these types of error, see the technical reports.[4]

SAMPLE SIZE AND WEIGHTING

The total sample size initially specified for the R&D survey was approximately 22,000, and, as described above, was based primarily on compliance with predetermined sampling error constraints established for the large partition. The actual sample size was 23,541 companies which differed from the target for several reasons. First, the frame for the large partition was subjected to independent sampling. Each company in the frame had an independent chance of selection, based on its assigned probability, i.e., selection of a company was completely independent of the selection of any other company. In independent sampling, sample size itself is a random variable. Theoretically, a sample of size zero or a sample the size of the entire universe is possible, but the probabilities of these extremes are so small that these are nearly impossible situations. The actual sample size is usually quite close to the specified size. If there is too much deviation, the selection is repeated.

Second, a minimum probability rule was imposed for both partitions. As noted earlier, for the large partition, probabilities of selection proportionate to size were assigned each company, where size is the reported or imputed R&D value assigned each company. Selected companies received a sample weight which was the inverse of their probability of selection. Selected companies that ultimately report R&D expenditures vastly larger than their assigned values can have adverse effects on the statistics, which are based on the weighted value of survey responses. To lessen the effects on the final statistics, the maximum weight of a company was controlled by specifying a minimum probability that could be assigned to the company. If the probability, based on company size, was less than the minimum probability, then it was reset to this minimum value. The consequence of raising these original probabilities to the minimum probability was to raise the expected sample size. Similarly, a maximum weight for each stratum was established for the simple random sampling of the small partition. If the sample size initially allocated to a stratum resulted in a stratum weight above this maximum value, then the sample size was increased until the maximum weight was achieved. It is likely that most of the difference between the size of the target sample and the sample actually selected was because of these rules.

Third, a minimum sample size was established for each stratum of the small partition. If the proportionately allocated sample size fell below the minimum value for a given stratum, then the sample size was set equal to this value.

Finally, between the time that the frame was created and the survey was prepared for mailing, the operational status of some companies changed. That is, they were merged with or acquired by another company, or they were no longer in business. Before preparing the survey for mailing, the operational status is updated to identify these changes. As a result, the number of companies mailed a survey form is somewhat smaller than the number of companies initially selected for the survey.

SURVEY QUESTIONNAIRES

Two questionnaires are used each year to collect data for the survey. For large firms known to perform R&D, a detailed questionnaire, Form RD-1L, is used to collect data for odd-numbered years and an abbreviated version, Form RD-1S, is used to collect data for even-numbered years. The questionnaires are cycled in this manner to reduce reporting burden on survey respondents.

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[4] U.S. Department of Commerce, Bureau of the Census, *Documentation of Nonsampling Issues in the Survey of Industrial Research and Development*, RR94/03 (Washington, DC, Sept. 1994) and U.S. Department of Commerce, Bureau of the Census, *A Study of Processing Errors in the Survey of Industrial Research and Development*, ESMD-9403 (Washington, DC, Sept. 1994).

The Form RD-1L requests data on sales or receipts, total employment, employment of scientists and engineers, expenditures for R&D performed within the company with Federal funds and with company and other funds, character of work (basic research, applied research, and development), company-sponsored R&D expenditures in foreign countries, R&D performed under contract by others, expenditures for pollution abatement and energy R&D, detail on R&D by product field, Federal R&D support to the firm by contracting agency, domestic R&D expenditures by State, and foreign R&D by country. The Form RD-1S requests the same information except for the last four items. Because companies receiving the Forms RD-1L and RD-1S generally have participated in previous surveys, computer imprinted data reported by the company for the previous year are supplied for reference. Companies are encouraged to revise or update this imprinted data if they have more current information.

To further limit reporting burden on small R&D performers and on firms that are included in the sample for the first time, an even more abbreviated form is used each year. Form RD-1A collects data only on R&D, sales, employment, and operational status and includes a screening item that allows respondents to indicate that they do not perform R&D before completing the questionnaires. No prior-year information is available since the majority of the companies have not reported previously.

For the 1994 survey, about 2,700 companies that reported $1 million or more in R&D spending in the 1993 survey or had 1,000 employees or more received Form RD-1S and nearly 20,800 received Form RD-1A. Of the 23,500 firms, 4,800 reported R&D expenditures. Both questionnaires and their accompanying instructions are reproduced in section C, Survey Documents.

FOLLOW-UP FOR SURVEY NONRESPONSE

The 1994 survey questionnaires were mailed in March 1995, and recipients were asked to respond within 60 days. Thirty days later, letters were mailed to all survey recipients reminding them that their completed questionnaire was due within the next 30 days. Copies of the Form RD-1A and instructions were faxed to respondents who called a toll-free telephone number indicated in the follow-up letters. After 60 days, follow-up letters were sent to all nonresponding firms. Three additional follow-up mailings were made to persistent nonrespondents, after 90, 120, and 150 days.

In addition to the mailings, telephone follow-up was used to encourage response from those firms ranked among the 300 largest R&D performers, based on total R&D expenditures reported in the previous survey. Telephone follow-up was also used for these firms during the initial data edit phase of survey operations if data items were missing or unclear. Table B-3 shows the number of companies in each industry or industry group that received a questionnaire and the percentage that responded to the survey.

IMPUTATION FOR ITEM NONRESPONSE

For various reasons, many firms chose to return the survey questionnaires with one or more blank items.[5] For instance, the internal accounting procedures of the firm may not have allowed it to quantify the pollution-abatement expenditures portion of R&D. In addition, some firms, as a matter of policy, refused to answer any voluntary questions.[6]

When respondents did not provide the requested information, estimates for the missing data were made using imputation algorithms. In general, the imputation algorithms computed values for missing items by applying the average percentage change for the target item in the nonresponding firm's industry to the item's prior-year value for that firm, reported or imputed. This approach, with minor variation, was used for most items.[7] Table B-4 contains imputation rates for the principal survey items.

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[5] For detailed discussions on the sources, control, and measurement of error resulting from item nonresponse, see the technical report: U.S. Department of Commerce, Bureau of the Census, *Documentation of Nonsampling Error Issues in the Survey of Industrial Research and Development*, RR94/03 (Washington, DC, Sept. 21, 1994). For a general discussion of the problems stemming from item nonresponse, see the technical report: National Science Foundation, *Estimating Basic and Applied Research and Development in Industry: A Preliminary Review of Survey Procedures*, NSF 90-322 (Washington, DC, 1990).

[6] All but four items—total R&D, Federal R&D, net sales, and total employment—which are included in the Census Bureau's annual mandatory statistical program, are voluntary. See further discussion under Response Rates and Mandatory Versus Voluntary Reporting, later in this section.

[7] For detailed descriptions and analyses of the imputation methods and algorithms used, see the technical report: U.S. Department of Commerce, Bureau of the Census, *An Evaluation of Imputation Methods for the Survey of Industrial Research and Development*, ESMD-9404 (Washington, DC, Sept. 1994).

Table B-3. Unit response rates—percentage of companies responding to survey, by industry: 1994

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Industry	SIC code	Number of companies that received questionnaire	Response rate
Total, all companies		23,519	84.8
Distribution by industry:			
Food, kindred, and tobacco products	20,21	488	85.2
Textiles and apparel	22,23	1,111	74.9
Lumber, wood products, and furniture	24.25	2,570	83.8
Paper and allied products	26	226	90.3
Chemicals and allied products	28	431	89.1
Industrial chemicals	281–82,286	140	87.1
Drugs and medicines	283	125	88.1
Other chemicals	284–85,287–89	166	91.6
Petroleum refining and extraction	13,29	481	85.9
Rubber products	30	271	86.0
Stone, clay, and glass products	32	612	83.8
Primary metals	33	548	86.9
Ferrous metals and products	331–32,3398–99	271	89.3
Nonferrous metals and products	333–36	277	84.5
Fabricated metal products	34	1,818	86.5
Machinery	35	1,014	87.1
Office, computing, and accounting machines	357	159	81.8
Other machinery, except electrical	351–56,358–59	855	88.1
Electrical equipment	36	791	86.1
Radio and TV receiving equipment	365	88	81.8
Communication equipment	366	162	86.4
Electronic components	367	207	87.9
Other electrical equipment	361–64,369	334	85.9
Transportation equipment	37	478	87.5
Motor vehicles and motor vehicles equipment	371	182	87.5
Other transportation equipment	373–75,379	177	89.8
Aircraft and missiles	372,376	119	84.0
Professional and scientific instruments	38	462	86.8
Scientific and mechanical measuring instruments	381–82	221	89.1
Optical, surgical, photographic, and other instruments	384–87	241	84.6
Other manufacturing industries	27,31,39	1,880	84.0
Nonmanufacturing industries	07–10,12–17, 40–42, 44–49, 50-59, 60-65, 67, 701, 73, 75–76, 78–79, 80–81, 83–85, 87, 89	10,338	84.9

See explanatory information and SOURCE at end of tables.

Table B-3. Unit response rates—percentage of companies responding to survey, by industry: 1994

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Industry	SIC code	Number of companies that received questionnaire	Response rate
Total, all companies receiving Form RD-1S		2,727	88.8
Distribution by industry:			
Food, kindred, and tobacco products	20,21	78	87.2
Textiles and apparel	22,23	52	82.7
Lumber, wood products, and furniture	24,25	24	95.8
Paper and allied products	26	49	93.9
Chemicals and allied products	28	240	92.5
Food, kindred, and tobacco products	281–82,286	75	89.3
Drugs and medicines	283	78	92.3
Other chemicals	284–85,287–89	87	95.4
Petroleum refining and extraction	13,29	31	83.9
Rubber products	30	88	92.0
Stone, clay, and glass products	32	36	94.4
Primary metals	33	61	86.9
Ferrous metals and products	331–32,3398–99	30	93.3
Nonferrous metals and products	333–36	31	80.6
Fabricated metal products	34	104	92.3
Machinery	35	396	87.6
Office, computing, and accounting machines	357	132	84.1
Other machinery, except electrical	351–56,358–59	264	89.4
Electrical equipment	36	411	88.3
Radio and TV receiving equipment	365	9	66.7
Communication equipment	366	131	87.8
Electronic components	367	151	90.1
Other electrical equipment	361–64,369	120	88.3
Transportation equipment	37	95	93.7
Motor vehicles and motor vehicles equipment	371	43	97.7
Other transportation equipment	373–75,379	18	94.4
Aircraft and missiles	372,376	34	88.2
Professional and scientific instruments	38	315	90.2
Scientific and mechanical measuring instruments	381–82	161	92.5
Optical, surgical, photographic, and other instruments	384–87	154	87.7
Other manufacturing industries	27,31,39	66	92.4
Nonmanufacturing industries	07–10,12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–85, 87, 89	681	85.9

See explanatory information and SOURCE at end of tables.

Table B-3. Unit response rates—percentage of companies responding to survey, by industry: 1994

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Industry	SIC code	Number of companies that received questionnaire	Response rate
Total, all companies receiving Form RD-1A		20,792	84.2
Distribution by industry:			
Food, kindred, and tobacco products	20,21	410	84.9
Textiles and apparel	22,23	1,059	74.5
Lumber, wood products, and furniture	24,25	2,546	83.7
Paper and allied products	26	177	89.3
Chemicals and allied products	28	191	84.9
Food, kindred, and tobacco products	281–82,286	65	84.6
Drugs and medicines	283	47	81.3
Other chemicals	284–85,287–89	79	87.3
Petroleum refining and extraction	13,29	450	86.0
Rubber products	30	183	83.1
Stone, clay, and glass products	32	576	83.2
Primary metals	33	487	86.9
Ferrous metals and products	331–32,3398–99	241	88.8
Nonferrous metals and products	333–36	246	85.0
Fabricated metal products	34	1,714	86.1
Machinery	35	618	86.7
Office, computing, and accounting machines	357	27	70.4
Other machinery, except electrical	351–56,358–59	591	87.5
Electrical equipment	36	380	83.7
Radio and TV receiving equipment	365	79	83.5
Communication equipment	366	31	80.6
Electronic components	367	56	82.1
Other electrical equipment	361–64,369	214	84.6
Transportation equipment	37	383	86.0
Motor vehicles and motor vehicles equipment	371	139	84.4
Other transportation equipment	373–75,379	159	89.3
Aircraft and missiles	372,376	85	82.4
Professional and scientific instruments	38	147	79.6
Scientific and mechanical measuring instruments	381–82	60	80.0
Optical, surgical, photographic, and other instruments	384–87	87	79.3
Other manufacturing industries	27,31,39	1,814	83.7
Nonmanufacturing industries	07–10,12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–78, 80–81, 83–85, 87, 89	9,657	84.9

NOTE: The calculation of the response rate was based on all companies that responded to the survey, including those that reported they were out of scope, out of business, or had merged with another company. It excludes RD-1S companies for which total R&D expenditure data were imputed.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table B-4. Imputation rates for selected items, by industry: 1994

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Industry	SIC code	Net sales	Total employment	R&D scientists/ engineers	Total R&D			R&D outside company	Foreign R&D
					Total	Company	Federal		
	Percent								
Total		0.8%	0.1%	32.8%	6.1%	6.9%	4.3%	9.5%	6.2%
Food, kindred, and tobacco products	20,21	3.0	2.7	28.5	3.6	3.6	0.0	0.0	0.0
Textiles and apparel	22,23	2.9	0.1	33.3	22.6	19.9	93.2	0.0	0.0
Lumber, wood products, and furniture	24,25	0.5	0.0	26.1	2.4	1.3	99.3	0.0	0.0
Paper and allied products	26	1.0	3.3	23.6	3.0	3.1	0.0	0.0	0.0
Chemicals and allied products	28	4.9	4.9	26.7	6.2	7.0	0.2	10.5	5.4
Industrial chemicals	281–82,286	4.8	3.7	22.9	2.9	4.5	0.2	0.0	0.0
Drugs and medicines	283	9.8	8.7	30.5	9.2	9.3	3.1	12.3	8.6
Other chemicals	284–85,287–89	1.5	2.4	20.5	1.8	1.8	0.8	0.2	0.1
Petroleum refining and extraction	13,29	0.5	7.7	43.9	1.7	1.8	0.0	0.0	0.0
Rubber products	30	1.2	0.0	20.3	2.7	2.8	0.0	0.0	0.0
Stone, clay, and glass products	32	0.3	0.0	30.1	1.8	2.0	0.0	0.0	0.0
Primary metals	33	0.8	2.3	27.8	7.0	6.9	11.0	0.0	3.7
Ferrous metals and products	331–32,3398–99	0.2	1.3	19.5	7.3	7.6	0.0	0.0	0.0
Nonferrous metals and products	333–36	3.5	3.7	31.0	6.8	6.6	17.3	0.0	4.0
Fabricated metal products	34	0.8	0.1	21.2	5.7	4.9	9.1	2.2	0.0
Machinery	35	1.1	0.3	23.1	8.5	8.6	1.3	0.0	0.0
Office, computing, and accounting machines	357	12.6	0.4	29.2	12.5	12.5	0.1	0.0	0.0
Other machinery, except electrical	351–56,358–59	0.7	0.3	18.0	4.5	4.6	1.7	0.1	0.0
Electrical equipment	36	5.8	6.7	43.6	19.9	18.4	33.8	0.0	0.0
Radio and TV receiving equipment	365	5.1	0.6	44.6	16.0	16.1	0.0	0.0	0.0
Communication equipment	366	29.3	34.9	70.1	44.6	43.1	54.9	0.0	0.0
Electronic components	367	4.9	3.6	30.0	4.5	4.7	0.3	0.0	0.0
Other electrical equipment	361–64,369	1.1	1.9	14.4	2.3	2.7	0.2	0.0	0.0

See explanatory note and SOURCE at end of table.

Table B-4. Imputation rates for selected items by industry: 1994

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Industry	SIC code	Net sales	Total employment	R&D scientists/ engineers	Total R&D: Total	Total R&D: Company	Total R&D: Federal	R&D outside company	Foreign R&D
	Percent								
Transportation equipment	37	0.1%	0%	42.6%	0.2%	1.5%	0.5%	0%	0%
Motor vehicles and motor vehicles equipment	371	0.0	0.0	37.4	0.0	1.5	1.6	0.0	0.0
Other transportation equipment	373–75,379	0.0	0.0	78.7	0.4	0.9	0.0	0.0	0.0
Aircraft and missiles	372,376	0.7	0.9	43.5	0.3	1.6	0.3	0.0	0.0
Professional and scientific instruments	38	2.7	9.0	60.1	5.7	7.8	0.8	0.0	0.0
Scientific and mechanical measuring instruments	381–82	14.9	14.4	64.5	6.9	12.7	0.4	0.0	0.0
Optical, surgical, photographic, and other instruments	383–87	0.4	3.3	45.6	3.8	3.6	11.2	0.0	0.0
Other manufacturing industries	21,27,31,39		0.1	36.5	3.4	3.5	0.0	0.0	0.0
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–85, 87, 89	0.3	0.0	17.2	4.6	4.7	4.2	0.0	0.0

SOURCE: National Science Foundation/SRS, *Research and Development in Industry: 1994*

RESPONSE RATES AND MANDATORY VERSUS VOLUNTARY REPORTING

Current survey reporting requirements divide survey items into two groups: mandatory and voluntary. Response to four data items on the questionnaires—total R&D expenditures, Federal R&D funds, net sales, and total employment—are mandatory; response to the remaining items is voluntary. During the 1990 survey cycle, NSF conducted a test of the effect of reporting on a completely voluntary basis to determine if combining both mandatory and voluntary items on one questionnaire influences response rates. For this test, the 1990 sample was divided into two panels of approximately equal size. One panel, the mandatory panel, was asked to report as usual (four mandatory items and the remainder voluntary), and the other panel was asked to report all items on a completely voluntary basis. The result of the test was a decrease in the overall survey response rate to 80 percent from levels of 88 percent in 1989 and 89 percent in 1988. The response rates for the mandatory and voluntary panels were 89 percent and 69 percent, respectively. Detailed results of the test were published in *Research and Development in Industry: 1990*. For firms that reported R&D expenditures in 1994, table B-5 shows the percentage that also reported data for other selected items.

CHARACTER OF WORK

Response to questions about character of work (basic research, applied research, and development) declined in the mid-1980s, and, as a result, imputation rates increased. The general imputation procedure described above became increasingly dependent upon information imputed in prior years, thereby distancing current-year estimates from any reported information. Because of the increasing dependence on imputed data, NSF chose not to publish character-of-work estimates in 1986. Consequently, the imputation procedure used to develop these estimates was revised in 1987 for use with 1986 and later data and differs from the general imputation approach. The new method calculates the character-of-work distribution for a nonresponding firm only if that firm reported a distribution within a five-year period, extending from two years before to two years after the year requiring imputation. Imputation for a given year is initially performed in the year the data are collected and is based on a character-of-work distribution reported in either of the two previous years, if any. It is again performed using new data collected in the next two years. Thus, character-of-work estimates are revised as newly reported information becomes available and are not final for two years following their initial publication.

If no reported data are available for a firm, character-of-work estimates are not imputed. As a consequence, only a portion of the total estimated R&D expenditures are distributed at the firm level. Those expenditures not meeting the requirements of the new imputation methodology are placed in a "not distributed" category. Tables B-6, B-7, and B-8 show the character-of-work estimates along with the "not distributed" component for 1992, 1993, and 1994, respectively.

NSF's objective in conducting the survey has always been to provide estimates for the entire population of firms performing R&D in the United States. However, the revised imputation procedure would no longer produce such estimates because of the "not distributed" component. So, a baseline estimation method was developed to allocate the "not distributed" amounts among the character-of-work components. In the baseline estimation method, the "not distributed" expenditures are allocated by industry group to basic research, applied research, and development categories, using the percentage splits in the distributed category for that industry. The allocation is done at the lowest level of published industry detail only; higher levels are derived by aggregation (just as national totals are derived by aggregation of individual industry estimates) and result in higher performance shares for basic and applied research and lower estimates for development's share than would have been calculated using the previous method.[8] The estimates of basic research, applied research, and development provided in section A of this report were calculated using the baseline estimation method.

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[8] See the NSF technical report cited previously for an explanation of the uncertainties in the data and to quantify their sensitivity to the choice of various possible imputation procedures.

Table B-5. Item response rates—percentage of R&D-performing companies that reported total R&D expenditures and responded to selected items: 1994

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Data Item	Response Rate 1/	
	Form RD-1S 2/	Form RD-1A 2/
Sales	98.6%	99.5%
Total Employment	98.1	98.8
Scientist and Engineers	80.5	85.2
Federal R&D	99.3	98.7
Company R&D	3/	3/
Total R&D	100.0	100.0
Foreign R&D	48.3	54.6
Contracted Out	45.2	60.5
Energy R&D	4/	4/
Pollution Abatement R&D	4/	4/

1/ Response rates are based on reported data for companies that reported total R&D expenditures. Imputed data are not included. Companies that reported they were out of scope and out of business, merged with another company, or had no R&D expenditures for 1994 were excluded from the calculation of response rates.

2/ See technical notes for descriptions of the survey questionnaire forms.

3/ Item response for "Federal R&D" and for "Company R&D" is considered together; companies that report "Total R&D" and either of these expenditures implicitly report both company and Federal R&D, since these two items sum to total R&D.

4/ Response rates are not provided because estimates for these survey items were not published in 1994 and because Form RD-1A does not include these items. See technical notes for more information about contents of the questionnaire.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table B-6. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1992

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Distribution by industry	SIC code	Total			Basic			Applied		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[Dollars in millions]								
Total		$119,110	$24,722	$94,388	$5,986	$910	$5,076	$22,548	$4,325	$18,223
Food, kindred, and tobacco products	20,21	1,386	0	1,386	116	0	116	400	0	400
Textiles and apparel	22,23	(D)	(D)	261	23	0	23	(D)	(D)	27
Lumber, wood products, and furniture	24,25	(D)	(D)	234	(D)	(D)	15	75	0	75
Paper and allied products	26	(D)	(D)	1,182	(D)	0	(D)	(D)	(D)	(D)
Chemicals and allied products	28	15,381	(S)	15,091	(D)	(D)	1,689	4,312	16	4,296
Industrial chemicals	281–82,286	5,165	(S)	4,911	(D)	(D)	462	1,018	14	1,004
Drugs and medicines	283	7,944	(S)	7,934	(D)	(D)	1,100	(D)	(D)	2,550
Other chemicals	284–85,287–89	2,272	(S)	2,246	(D)	(D)	127	(D)	(D)	742
Petroleum refining and extraction	13,29	2,277	9	2,268	(D)	(D)	(D)	787	0	787
Rubber products	30	(D)	(D)	1,256	63	0	63	161	0	161
Stone, clay, and glass products	32	(D)	(D)	479	(D)	(D)	39	(D)	(D)	168
Primary metals	33	522	(S)	514	(D)	(D)	27	(D)	(D)	198
Ferrous metals and products	331–32,3398–99	(D)	(D)	221	(D)	(D)	(D)	(D)	0	(D)
Nonferrous metals and products	333–36	(D)	(D)	293	(D)	0	(D)	(D)	(D)	(D)
Fabricated metal products	34	1,017	294	723	(D)	(D)	43	(D)	(D)	125
Machinery	35	14,938	1,035	13,903	(D)	(D)	580	(D)	(D)	1,475
Office, computing, and accounting machines	357	(D)	(D)	10,614	(D)	(D)	(D)	(D)	(D)	728
Other machinery, except electrical	351–56,358–59	(D)	(D)	3,289	(D)	(D)	(D)	766	19	747
Electrical equipment	36	13,360	3,844	9,516	(D)	(D)	276	(D)	(D)	2,146
Radio and TV receiving equipment	365	(D)	(D)	93	(D)	(D)	(D)	8	0	8
Communication equipment	366	(D)	(D)	3,381	(D)	(D)	(D)	(D)	(D)	489
Electronic components	367	3,567	247	3,320	(D)	(D)	105	(D)	(D)	768
Other electrical equipment	361–64,369	(D)	(D)	2,722	(D)	(D)	121	(D)	(D)	881
Transportation equipment	37	27,494	11,202	16,292	(D)	(D)	122	(D)	(D)	1,178
Motor vehicles and motor vehicles equipment	371	(D)	(D)	9,132	62	0	62	(D)	(D)	(D)
Other transportation equipment	373–75,379	(D)	(D)	289	(D)	(D)	26	(D)	(D)	(D)
Aircraft and missiles	372,376	17,158	(S)	6,871	249	214	34	1,603	889	714

See explanatory information and SOURCE at end of table.

Table B-6. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1992

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Distribution by industry	SIC code	Total			Basic			Applied		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[Dollars in millions]								
Professional and scientific instruments	38	$9,542	$2,221	$7,321	(D)	(D)	$396	(D)	(D)	$1,687
Scientific and mechanical measuring instruments	381–82	5,156	2,143	3,013	(D)	(D)	139	(D)	(D)	955
Optical, surgical, photographic, and other instruments	384–87	4,386	78	4,308	(D)	(D)	257	(D)	(D)	732
Other manufacturing industries	27,31,39	660	61	599	71	0	71	(D)	(D)	83
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	28,933	5,570	23,363	1,975	655	1,320	6,412	1,416	4,996

See explanatory information and SOURCE at end of table.

Table B-6. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1992

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Distribution by industry	SIC code	Development			Expenditures not distributed			Percent of expenditures not distributed		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[Dollars in millions]								
Total		$75,687	$16,780	$58,907	$14,890	(S)	(S)	12.5%	11.0%	12.9%
Food, kindred, and tobacco products	20,21	704	0	704	166	0	(S)	12.0	0.0	12.0
Textiles and apparel	22,23	143	4	139	(D)	(D)	72	29.2	58.8	27.6
Lumber, wood products, and furniture	24,25	(D)	(D)	120	24	0	(S)	(D)	(D)	10.3
Paper and allied products	26	409	0	409	(D)	4	(D)	17.0	(D)	(D)
Chemicals and allied products	28	(D)	(D)	6,933	2,205	(S)	(S)	14.3	10.7	14.4
Industrial chemicals	281–82,286	(D)	(D)	2,797	653	5	(S)	12.6	2.0	13.2
Drugs and medicines	283	(D)	(D)	2,968	(D)	(D)	(S)	(D)	(D)	16.6
Other chemicals	284–85,287–89	(D)	(D)	1,167	(D)	(D)	(S)	(D)	(D)	9.3
Petroleum refining and extraction	13,29	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Rubber products	30	(D)	(D)	812	219	0	(S)	(D)	(D)	17.5
Stone, clay, and glass products	32	(D)	(D)	250	21	0	(S)	(D)	(D)	4.6
Primary metals	33	238	2	236	53	0	(S)	10.2	0.0	10.3
Ferrous metals and products	331–32,3398–99	(D)	(D)	107	(D)	0	(D)	6.7	(D)	(D)
Nonferrous metals and products	333–36	(D)	(D)	129	(D)	0	(D)	(D)	(D)	(D)
Fabricated metal products	34	643	227	415	(D)	(D)	(S)	(D)	(D)	19.2
Machinery	35	9,720	555	9,165	2,723	(S)	(S)	18.2	3.9	19.3
Office, computing, and accounting machines	357	(D)	(D)	(D)	(D)	(D)	(D)	20.9	0.6	(D)
Other machinery, except electrical	351–56,358–59	(D)	(D)	(D)	(D)	(D)	(D)	9.2	23.2	(D)
Electrical equipment	36	7,973	2,679	5,293	(S)	(S)	(S)	14.5	3.6	18.9
Radio and TV receiving equipment	365	(D)	(D)	(D)	(D)	(D)	(D)	5.3	0.0	(D)
Communication equipment	366	(D)	(D)	(D)	(D)	(D)	(D)	23.1	2.5	(D)
Electronic components	367	2,429	165	2,264	(D)	(D)	(S)	(D)	(D)	5.5
Other electrical equipment	361–64,369	(D)	(D)	1,208	(D)	(D)	(S)	12.4	3.9	(D)

See explanatory information and SOURCE at end of table.

Table B-6. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1992

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Distribution by industry	SIC code	Development			Expenditures not distributed			Percent of expenditures not distributed		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[Dollars in millions]								
Transportation equipment	37	$23,660	$9,120	$14,541	(D)	(D)	(S)	(D)	(D)	2.8%
Motor vehicles and motor vehicles equipment	371	(D)	(D)	(D)	(D)	0	(D)	0.2	(D)	(D)
Other transportation equipment	373–75,379	(D)	(D)	(D)	(D)	(D)	(D)	0.5	0.0	(D)
Aircraft and missiles	372,376	13,961	8,268	5,693	1,345	(S)	(S)	7.8	8.9	6.3
Professional and scientific instruments	38	5,811	1,834	3,976	(D)	(D)	(S)	(D)	(D)	17.2
Scientific and mechanical measuring instruments	381–82	3,357	1,775	1,582	(D)	(D)	(S)	(D)	(D)	11.2
Optical, surgical, photographic, and other instruments	384–87	2,454	60	2,394	(D)	(D)	(S)	(D)	(D)	21.4
Other manufacturing industries	27,31,39	(D)	(D)	376	69	0	69	(D)	(D)	11.5
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	16,787	2,009	14,778	3,759	1,490	2,269	13.0	26.8	9.7

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table B-7. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1993

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Distribution by industry	SIC code	Total			Basic			Applied		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[Dollars in millions]								
Total		$117,400	$22,809	$94,591	$6,297	$952	$5,345	$22,043	$4,698	$17,345
Food, kindred, and tobacco products	20,21	1,345	0	1,345	83	0	83	374	0	374
Textiles and apparel	22,23	(D)	(D)	286	(D)	(D)	29	(D)	(D)	25
Lumber, wood products, and furniture	24,25	(D)	(D)	196	(D)	(D)	13	42	0	42
Paper and allied products	26	(D)	(D)	1,191	(D)	(D)	167	(D)	(D)	449
Chemicals and allied products	28	(D)	(D)	16,658	2,112	13	2,099	(D)	(D)	5,313
Industrial chemicals	281–82,286	(D)	(D)	5,165	(D)	(D)	885	(D)	(D)	1,201
Drugs and medicines	283	9,146	15	9,132	(D)	(D)	(D)	3,379	8	3,371
Other chemicals	284–85,287–89	(D)	(D)	2,361	(D)	(D)	(D)	(D)	(D)	741
Petroleum refining and extraction	13,29	2,152	14	2,138	(D)	(D)	(D)	(D)	(D)	(D)
Rubber products	30	(D)	(D)	1,059	24	0	24	(D)	(D)	130
Stone, clay, and glass products	32	538	9	529	(D)	(D)	49	(D)	(D)	165
Primary metals	33	669	23	646	(D)	(D)	43	201	6 (S)	195
Ferrous metals and products	331–32,3398–99	289	17	272	(D)	(D)	19	(D)	(D)	77
Nonferrous metals and products	333–36	380	6	374	24	0	24	(D)	(D)	118 (S)
Fabricated metal products	34	1,158	222	936	(D)	(D)	77	152	7	144
Machinery	35	8,381	86	8,295	(D)	(D)	241	(D)	(D)	1,369
Office, computing, and accounting machines	357	4,950	33	4,917	(D)	(D)	78	(D)	(D)	802
Other machinery, except electrical	351–56,358–59	3,431	53	3,378	(D)	(D)	163	(D)	(D)	568
Electrical equipment	36	13,349	1,667	11,682	(D)	(D)	258	(D)	(D)	2,027
Radio and TV receiving equipment	365	(D)	(D)	87	9	0	9	(D)	(D)	11
Communication equipment	366	(D)	(D)	3,954	(D)	(D)	(D)	342	0	342
Electronic components	367	5,311	206	5,105	(D)	1	(D)	959	35 (S)	925
Other electrical equipment	361–64,369	(D)	(D)	2,537	(D)	(D)	97	(D)	(D)	749
Transportation equipment	37	27,258	10,617	16,640	(D)	(D)	116	1,893	887	1,006
Motor vehicles and motor vehicles equipment	371	(D)	(D)	10,659	(D)	(D)	74	(D)	(D)	460
Other transportation equipment	373–75,379	(D)	(D)	297	(D)	0	(D)	(D)	(D)	7
Aircraft and missiles	372,376	15,056	9,372	5,684	(D)	(D)	(D)	1,345	807	539

See explanatory information and SOURCE at end of table.

Table B-7. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1993

Page 2 of 4

Distribution by industry	SIC code	Total			Basic			Applied		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[Dollars in millions]								
Professional and scientific instruments	38	$10,119	$2,577	$7,542	(D)	(D)	$369	$1,957	$295	$1,661
Scientific and mechanical measuring instruments	381–82	5,681	2,484	3,196	(D)	(D)	129	1,338	275	1,063
Optical, surgical, photographic, and other instruments	384–87	4,438	92	4,346	(D)	(D)	240	619	21	598
Other manufacturing industries	27,31,39	(D)	(D)	758	(D)	(D)	120	69	0	69
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	30,831	6,140	24,690	2,207	669	1,537	6,287	2,529	3,758

See explanatory information and SOURCE at end of table.

Table B-7. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1993

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Distribution by industry	SIC code	Development			Expenditures not distributed			Percent of expenditures not distributed		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[Dollars in millions]								
Total		$77,552	$16,561	$60,991	$11,507	$597	$10,910	9.8%	2.6%	11.5%
Food, kindred, and tobacco products	20,21	701	0	701	188	0	188	14.0	0.0	14.0
Textiles and apparel	22,23	(D)	(D)	142	(D)	(D)	89	33.0	71.4	31.1
Lumber, wood products, and furniture	24,25	(D)	(D)	116	(D)	(D)	24	12.1	0.0	12.2
Paper and allied products	26	389	0	389	187	0	187	(D)	(D)	15.7
Chemicals and allied products	28	(D)	(D)	7,949	(D)	(D)	1,296	7.2	0.1	7.8
Industrial chemicals	281–82,286	(D)	(D)	2,856	(D)	(D)	222 (S)	3.4	0.1	4.3
Drugs and medicines	283	(D)	(D)	(D)	(D)	0	(D)	(D)	(D)	(D)
Other chemicals	284–85,287–89	(D)	(D)	(D)	(D)	(D)	(D)	5.4	(D)	(D)
Petroleum refining and extraction	13,29	751	11	740	(D)	0	(D)	(D)	0.0	(D)
Rubber products	30	(D)	(D)	708	197	0	197	(D)	(D)	18.6
Stone, clay, and glass products	32	276	4	272	(D)	(D)	43	(D)	(D)	8.1
Primary metals	33	(D)	(D)	358	50 (S)	0	50 (S)	7.5	0.0	7.7
Ferrous metals and products	331–32,3398–99	(D)	(D)	147	29 (S)	0	29 (S)	10.0	0.0	10.7
Nonferrous metals and products	333–36	(D)	(D)	211	21	0	21	5.5	0.0	5.6
Fabricated metal products	34	(D)	(D)	507	(D)	(D)	208	(D)	(D)	22.2
Machinery	35	5,481	62	5,419	(D)	(D)	1,266 (S)	15.2	4.7	15.3
Office, computing, and accounting machines	357	3,300	28	3,272	766 (S)	0	766 (S)	15.5	0.0	15.6
Other machinery, except electrical	351–56,358–59	2,181	34	2,147	(D)	(D)	500	(D)	(D)	14.8
Electrical equipment	36	6,640	1,080	5,560	(D)	(D)	3,837	(D)	(D)	32.8
Radio and TV receiving equipment	365	(D)	(D)	58	9	0	9	(D)	(D)	10.3
Communication equipment	366	(D)	(D)	(D)	(D)	(D)	(D)	40.6	41.1	(D)
Electronic components	367	(D)	171	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other electrical equipment	361–64,369	(D)	(D)	1,213	(D)	(D)	478	15.0	0.2	18.8

See explanatory information and SOURCE at end of table.

Table B-7. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1993

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Distribution by industry	SIC code	Development			Expenditures not distributed			Percent of expenditures not distributed		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[Dollars in millions]								
Transportation equipment	37	(D)	(D)	$14,503	(D)	(D)	$1,016	(D)	(D)	6.1%
Motor vehicles and motor vehicles equipment	371	(D)	(D)	10,080	45	0	45	(D)	(D)	0.4
Other transportation equipment	373–75,379	(D)	(D)	(D)	(D)	0	(D)	11.0	0.0	(D)
Aircraft and missiles	372,376	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Professional and scientific instruments	38	7,063	2,257	4,806	(D)	(D)	706	(D)	(D)	9.4
Scientific and mechanical measuring instruments	381–82	(D)	(D)	1,746	(D)	(D)	258 (S)	(D)	(D)	8.1
Optical, surgical, photographic, and other instruments	384–87	(D)	(D)	3,060	448	0	448	10.1	0.0	10.3
Other manufacturing industries	27,31,39	(D)	(D)	431	139	0	139	(D)	(D)	18.3
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	21,319	2,929	18,390	1,018	13	1,005	3.3	0.2	4.1

KEY:

(D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

Table B-8. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1994

Page 1 of 4

Distribution by industry	SIC code	Total			Basic			Applied		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[Dollars in millions]								
Total		$119,595	$22,463	$97,131	$6,374	$921	$5,453	$20,934	$4,040	$16,894
Food, kindred, and tobacco products	20,21	1,476	0	1,476	101	0	101	419	0	419
Textiles and apparel	22,23	(D)	(D)	316	(D)	(D)	27	(D)	(D)	32
Lumber, wood products, and furniture	24,25	(D)	(D)	201	(D)	(D)	23	(D)	(D)	37
Paper and allied products	26	(D)	(D)	1,263	(D)	(D)	175	(D)	(D)	507
Chemicals and allied products	28	(D)	(D)	16,559	2,405	9	2,396	(D)	(D)	4,896
Industrial chemicals	281–82,286	(D)	(D)	4,780	(D)	(D)	1,030	(D)	(D)	(D)
Drugs and medicines	283	9,633	8	9,625	(D)	1	(D)	2,959	5	2,954
Other chemicals	284–85,287–89	(D)	(D)	2,154	(D)	(D)	(D)	(D)	(D)	(D)
Petroleum refining and extraction	13,29	1,950	10	1,939	(D)	0	(D)	464	6	459
Rubber products	30	(D)	(D)	1,432	25	0	25	(D)	(D)	145
Stone, clay, and glass products	32	591	38	553	47	0	47	200	37	163
Primary metals	33	690	17	672	(D)	(D)	92	(D)	(D)	187
Ferrous metals and products	331–32,3398–99	(D)	(D)	241	(D)	(D)	17	(D)	(D)	77
Nonferrous metals and products	333–36	(D)	(D)	431	75	0	75	(D)	(D)	110
Fabricated metal products	34	1,111	243	868	(D)	(D)	69	(D)	(D)	162
Machinery	35	8,110	99	8,011	235	7	228	1,351	36	1,316
Office, computing, and accounting machines	357	4,106	28	4,078	(D)	(D)	60	(D)	(D)	692
Other machinery, except electrical	351–56,358–59	4,004	71	3,933	(D)	(D)	169	(D)	(D)	624
Electrical equipment	36	15,338	1,801	13,537	(D)	(D)	272	(D)	(D)	1,732
Radio and TV receiving equipment	365	(D)	(D)	64	(D)	(D)	(D)	(D)	0	(D)
Communication equipment	366	(D)	(D)	4,939	(D)	(D)	(D)	(D)	(D)	(D)
Electronic components	367	6,032	162	5,870	(D)	(D)	80	(D)	(D)	908
Other electrical equipment	361–64,369	(D)	(D)	2,664	(D)	(D)	97	(D)	(D)	410
Transportation equipment	37	28,087	10,392	17,695	228	102	126	1,926	739 (S)	1,186
Motor vehicles and motor vehicles equipment	371	(D)	(D)	11,950	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment	373–75,379	(D)	(D)	279	27	0	27	(D)	(D)	(D)
Aircraft and missiles	372,376	14,260	8,794	5,466	(D)	(D)	(D)	(D)	(D)	(D)

See explanatory information and SOURCE at end of table.

Table B-8. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1994

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Distribution by industry	SIC code	Total			Basic			Applied		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[Dollars in millions]								
Professional and scientific instruments	38	$11,441	$3,384	$8,058	(D)	(D)	$415	$1,901	$298	$1,603
Scientific and mechanical measuring instruments	381–82	6,952	3,266	3,687	(D)	(D)	172	1,292	270	1,021
Optical, surgical, photographic, and other instruments	384–87	4,489	118	4,371	(D)	(D)	243	610	28	582
Other manufacturing industries	27,31,39	(D)	(D)	796	(D)	(D)	83	116	0	116
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	28,846	5,090	23,756	1,961	680	1,281	5,943	2,007	3,935

See explanatory information and SOURCE at end of table.

Table B-8. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1994

Distribution by industry	SIC code	Development			Expenditures not distributed			Percent of expenditures not distributed		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[Dollars in millions]								
Total		$79,937	$16,217	$63,719	$12,350	$1,285 (S)	$11,065	10.3%	5.7%	11.4%
Food, kindred, and tobacco products	20,21	788	0	788	168	0	168	11.4	0.0	11.4
Textiles and apparel	22,23	(D)	(D)	153	(D)	(D)	104 (S)	34.9	75.0	32.9
Lumber, wood products, and furniture	24,25	(D)	(D)	113	27	0	27	(D)	(D)	13.4
Paper and allied products	26	360	0	360	221	0	221	(D)	(D)	17.5
Chemicals and allied products	28	8,458	610	7,848	(D)	(D)	1,419	8.0	0.1	8.6
Industrial chemicals	281–82,286	(D)	(D)	(D)	(D)	(D)	202 (S)	3.4	0.1	4.2
Drugs and medicines	283	(D)	2	(D)	(D)	0	(D)	(D)	(D)	(D)
Other chemicals	284–85,287–89	(D)	(D)	(D)	138	0	138	(D)	(D)	6.4
Petroleum refining and extraction	13,29	(D)	5	(D)	(D)	0	(D)	(D)	0.0	(D)
Rubber products	30	894	0	894	369	0	369	(D)	(D)	25.8
Stone, clay, and glass products	32	310	1	308	35	0	35	5.9	0.0	6.3
Primary metals	33	(D)	(D)	329	65	0	65	9.4	0.0	9.7
Ferrous metals and products	331–32,3398–99	(D)	(D)	126	21 (S)	0	21 (S)	(D)	(D)	8.7
Nonferrous metals and products	333–36	(D)	(D)	203	44	0	44	(D)	(D)	10.2
Fabricated metal products	34	739	205	534	(D)	(D)	103	(D)	(D)	11.9
Machinery	35	5,906	57	5,849	617	0	617	7.5	0.0	7.6
Office, computing, and accounting machines	357	3,217	13	3,204	122 (S)	0	122 (S)	3.0	0.0	3.0
Other machinery, except electrical	351–56,358–59	2,689	43	2,646	495	0	495	12.2	0.0	12.4
Electrical equipment	36	8,089	1,051 (S)	7,038	(D)	(D)	4,495	(D)	(D)	33.2
Radio and TV receiving equipment	365	34	0	34	(D)	(D)	4	(D)	(D)	6.3
Communication equipment	366	(D)	(D)	2,529	(D)	(D)	(D)	(D)	(D)	(D)
Electronic components	367	3,013	150	2,864	(D)	0	(D)	(D)	(D)	(D)
Other electrical equipment	361–64,369	(D)	(D)	1,612	(D)	(D)	545	17.2	0.6	20.5

See explanatory information and SOURCE at end of table.

Table B-8. Funds for performance of basic research, applied research, development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1994

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Distribution by industry	SIC code	Development			Expenditures not distributed			Percent of expenditures not distributed		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[Dollars in millions]								
Transportation equipment	37	$24,650	$8,989	$15,662	$1,284	$563	$721	4.6%	5.4%	4.1%
Motor vehicles and motor vehicles equipment	371	(D)	(D)	(D)	69	0	69	(D)	(D)	0.6
Other transportation equipment	373–75,379	(D)	(D)	(D)	(D)	0	(D)	(D)	(D)	28.7
Aircraft and missiles	372,376	11,770	7,468	4,302	(D)	563	(D)	8.0	6.4	10.4
Professional and scientific instruments	38	(D)	(D)	5,032	(D)	(D)	1,007	(D)	(D)	12.5
Scientific and mechanical measuring instruments	381–82	(D)	(D)	1,929	(D)	(D)	564 (S)	(D)	(D)	15.3
Optical, surgical, photographic, and other instruments	384–87	(D)	(D)	3,103	443	0	443	9.9	0.0	10.1
Other manufacturing industries	27,31,39	(D)	(D)	515	81	0	81	(D)	(D)	10.2
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	19,885	2,334 (S)	17,552	1,057	69	988	3.7	1.4	4.1

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

COMPARABILITY OF STATISTICS

This section summarizes the statistical revisions that have been made because of changes in survey procedures and practices.[9]

REVISIONS TO IMMEDIATE PRIOR-YEAR STATISTICS

As has been the practice throughout the history of the Survey of Industrial Research and Development, results from the current-year survey are used not only to develop current-year statistics, but also to revise immediate prior-year statistics. Changes to reported data can come from three sources: from respondents (see discussion above under "Survey Questionnaires"), from analysts involved in survey and statistical processing, and from the industry reclassification process. Respondents from companies that were in both the 1993 and 1994 surveys may have revised previously reported data for 1993 because data were received or developed too late to include in the initial estimates. In follow-up conversations with respondents, analysts may have corrected previously reported data or supplied missing data. Analysts also examined the initial industry classification of companies and may have made changes. For example, during processing for the 1993 survey analysts found a few instances of industry reclassification because of small fluctuations in payroll (see "Industry Shifts" below) and not true shifts in company activity.

YEAR-TO-YEAR CHANGES

Comparability from year-to-year may be affected by new sample design, annual sample selection, industry shifts, and data revisions.

SAMPLE DESIGN

Changes to the sample design can affect comparability of year-to-year estimates. By far the most profound influence on statistics from recent surveys occurred when the new sample design for the 1992 survey was introduced. Revisions to the 1991 statistics were dramatic (see *Research and Development in Industry: 1992* for a detailed discussion). The sample design used for the 1992, 1993, and 1994 surveys are comparable in terms of size and coverage. While the allocation of the sample was changed somewhat, the design of the sample had little effect on the comparability of the statistics for this three-year period.

ANNUAL SAMPLE SELECTION

With the introduction of annual sampling in 1992, more year-to-year change have resulted than when survey panels were used. There are two reasons why this is so. First, changes in classification of companies not surveyed were not reflected in the year-to-year movement. The wedging operation which was performed when a new sample was selected, was a means of adjusting the data series to account for the changes in classification that occurred in the frame (see the discussion on wedging below). Second, yearly correlation of R&D data is lost when independent samples are drawn each year.

INDUSTRY SHIFTS

The industry classification of companies is redefined each year with the creation of the sampling frame. By redefining the frame, the sample reflects current distributions of companies by size and industry. During this process, a company may move from one industry into another because of several factors: changes in a company's payroll composition, which is used to determine the industry classification code (see discussion above under "Frame Creation"), changes in the industry classification system itself, or changes in the way the industry classification code is assigned or revised during survey processing.

A company's payroll composition changes because of a number of events. Among them are (1) the growth or decline of product or service lines; (2) the merger of two or more companies; (3) the acquisition of one company by another; (4) divestitures; or (5) the formation of conglomerates. Since the introduction of annual sampling in 1992, although unlikely, a company's data can be reclassified yearly. The result is that a downward movement in R&D expenditures in one industry is balanced by an upward movement in another industry from one year to the next.

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[9] See also the technical paper U.S. Department of Commerce, Bureau of the Census, *Documentation of the Survey Design for the Survey of Industrial Research and Development: A Historical Perspective* (Washington, DC, 1995).

From time to time the standard industrial classification (SIC) coding system, which is used by most Federal Government agencies that publish industry statistics, is revised to reflect the changing composition of U.S. industry. For statistics developed for 1988–91 from the 1988–91 surveys, companies retained the industry classifications assigned for the 1987 sample. These classifications were based on the 1977 SIC system. The last major revision of the SIC system was for 1987. This new system was used to classify companies in the post-1991 surveys.

Finally, the method used to classify firms during survey processing was revised slightly in 1992. Research has shown that the impact on individual industry estimates has been minor.[10] The current method used to classify firms is discussed above under "Frame Creation." Methods used for past surveys are discussed in the technical paper cited below.[11]

DATA REVISIONS

Changes to reported data can come from two sources: from respondents (see earlier discussion under Survey Questionnaires) and from analysts involved in survey and statistical processing. Respondents from companies that were in both the 1993 and 1994 surveys may have revised previously reported data for 1993. Analysts, while performing follow-up, may have corrected incorrectly reported or supplied missing 1993 data. The industry-specific summary of changes in the 1993 R&D statistics resulting from data revisions and industry shifts are presented in table B-9.

RECENT SURVEY IMPROVEMENTS[12]

Before the 1992 survey, the sample of firms surveyed was selected at irregular intervals.[13] In intervening years, a panel of the largest firms known to perform R&D was surveyed. For example, a sample of about 14,000 firms was selected for the 1987 survey. For the 1988 through 1991 studies, about 1,700 of these firms were annually resurveyed; the other firms did not receive another questionnaire and their R&D data were estimated. This sample design was adequate during the early years of the survey because the performance of R&D remained concentrated in relatively few manufacturing industries. However, as more and more firms began entering the R&D-performing arena, the old sample design proved increasingly deficient because it did not capture births of new R&D-performing firms. The entry of fledgling R&D performers into the marketplace was simply missed during panel years. Additionally, beginning in the early 1970s, the need for more detailed R&D information for nonmanufacturers was recognized. At that time, statistics for the broad industry classifications, miscellaneous business services and miscellaneous services, were added to the list of industry groups for which statistics were published. By 1975, about 3 percent of total R&D was performed by firms in nonmanufacturing industries.

During the mid-1980s, there was evidence that an increasing number of nonmanufacturing firms were conducting a significant amount of R&D, and again the number of industries used to develop the statistics for nonmanufacturers was increased. Consequently, the annual reports in this series for 1987 and since have included separate R&D estimates for firms in the communication, utility, engineering, architectural, research, development, testing, computer programming, and data processing service industries; hospitals; and medical labs. Approximately 9 percent of the estimated industrial R&D performance during 1987 was undertaken by nonmanufacturing firms.

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[10] The effects of recent changes in the way companies are classified during survey processing are discussed in detail in a Bureau of the Census technical memoranda entitled "Reclassification of Companies in the 1992 Survey of Industrial Research and Development for the Generation of the 'Analytical' Series" Oct. 25, 1994 and "Comparison of Company Coding Between 1992 and 1993 for the Survey of Industrial Research and Development" Nov. 3, 1994.

[11] U.S. Department of Commerce, Bureau of the Census, *Documentation of the Survey Design for the Survey of Industrial Research and Development: A Historical Perspective* (Washington, DC, 1995).

[12] See also National Science Foundation, *SRS Data Brief*, "1992 R&D Spending by U.S. Firms Rises, NSF Survey Improved" (NSF 94-325), (Arlington, VA, Sept. 9, 1994).

[13] During the early years of the survey, until 1967, samples were selected every 5 years. Subsequent samples were selected for 1971, 1976, 1981, and 1987.

[14] For the 1992 survey, 25 new nonmanufacturing industry and industry groups were added to the sample frame: agricultural services (SIC 07); fishing, hunting, and trapping (09); wholesale trade-nondurables (51); stationery and office supply stores (5112); industrial and personal service paper (5113); groceries and related products (514); chemicals and allied products (516); miscellaneous nondurable goods (519); home furniture, furnishings, and equipment stores (57); radio, TV, consumer electronics, and music stores (573); eating and drinking places (581); miscellaneous retail (59); nonstore retailers (596); real estates (65); holding and other investment offices (67); hotels, rooming houses, camps, and other lodging places (70); automotive repair, services, and parking (75); miscellaneous repair services (76); amusement and recreation services (79); health services (80); offices and clinics of medical doctors (801); offices and clinics of other health practitioners (804); miscellaneous health and allied services not elsewhere classified (809); engineering, accounting, research, management, and related services (87); and management and public relations services (874).

Table B-9. Comparison of original and revised 1993 total (company, Federal, and other) funds for industrial R&D performance, by industry and reason for revision

Page 1 of 2

Industry	SIC code	Total R&D [Dollars in millions] Original 1993 total R&D from 1993 survey	Revised 1993 total R&D from 1994 survey	Net revision to 1993 estimates	Reason for revision Industry shifts	Data revisions 1/
(1)		(2)	(3)	(4)	(5)	(6)
Total		$118,334	$117,400	($934)	$0	($934)
Food, kindred, and tobacco products	20,21	1,338	1,345	7	0	7
Textiles and apparel	22,23	(D)	(D)	(2)	0	(2)
Lumber, wood products, and furniture	24,25	(D)	(D)	(53)	0	(53)
Paper and allied products	26	(D)	(D)	(60)	0	(60)
Chemicals and allied products	28	(D)	(D)	(89)	0	(89)
Industrial chemicals	281–82,286	(D)	(D)	(109)	0	(109)
Drugs and medicines	283	9,147	9,146	(1)	0	(1)
Other chemicals	284–85,287–89	(D)	(D)	22	0	22
Petroleum refining and extraction	13,29	2,117	2,152	35	0	35
Rubber products	30	(D)	(D)	(33)	0	(33)
Stone, clay, and glass products	32	(D)	538	(D)	0	(D)
Primary metals	33	669	669	0	0	0
Ferrous metals and products	331–32,3398–99	289	289	0	0	0
Nonferrous metals and products	333–36	380	380	0	0	0
Fabricated metal products	34	(D)	1,158	(D)	(D)	497
Machinery	35	8,270	8,381	111	0	111
Office, computing, and accounting machines	357	4,811	4,950	139	0	139
Other machinery, except electrical	351–56,358–59	3,459	3,431	(28)	0	(28)
Electrical equipment	36	12,686	13,349	663	0	663
Radio and TV receiving equipment	365	(D)	(D)	3	0	3
Communication equipment	366	(D)	(D)	1,109	428	681
Electronic components	367	5,316	5,311	(5)	0	(5)
Other electrical equipment	361–64,369	(D)	(D)	(442)	(428)	(14)

See explanatory information and SOURCE at end of table.

Table B-9. Comparison of original and revised 1993 total (company, Federal, and other) funds for industrial R&D performance, by industry and reason for revision

Page 2 of 2

Industry	SIC code	Total R&D [Dollars in millions] Original 1993 total R&D from 1993 survey	Revised 1993 total R&D from 1994 survey	Net revision to 1993 estimates	Reason for revision Industry shifts	Data revisions 1/
(1)		(2)	(3)	(4)	(5)	(6)
Transportation equipment	37	$27,501	$27,258	($243)	$297	($540)
Motor vehicles and motor vehicles equipment	371	(D)	(D)	17	0	17
Other transportation equipment	373–75,379	(D)	(D)	297	297	0
Aircraft and missiles	372,376	15,615	15,056	(559)	0	(559)
Professional and scientific instruments	38	10,288	10,119	(169)	(323)	154
Scientific and mechanical measuring instruments	381–82	5,901	5,681	(220)	(323)	103
Optical, surgical, photographic, and other instruments	384–87	4,387	4,438	51	0	51
Other manufacturing industries	27,31,39	(D)	(D)	(5)	0	(5)
Nonmanufacturing industries	07–10, 12–17, 40–42, 44–49, 50–59, 60–65, 67, 701, 73, 75–76, 78–79, 80–81, 83–84, 87, 89	31,220	30,831	(389)	29	418

1/ Data revisions include respondent revisions to reported data, replacement of imputed data with reported data, and deletion of erroneously reported data.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1994

After the list of industries for which statistics were published was expanded, it became clear that the sample design itself should be changed to reflect the widening population of R&D performers among firms in the nonmanufacturing industries[14] and small firms in all industries, to account better for births of R&D-performing firms and to produce statistics that are generally more reliable. Beginning with the 1992 survey, NSF decided to (1) draw new samples with broader coverage annually and (2) increase the sample size to approximately 23,000 firms.[15] As a result of the sample redesign, for 1992, the reported nonmanufacturing share was estimated to be 25 percent of total R&D.

TIME SERIES ANALYSES

As discussed earlier, the statistics resulting from the survey are better indicators of changes in, rather than absolute levels of, R&D spending and personnel. Nevertheless, the statistics are often considered as a continuous time series that has been prepared using the same collection, processing, and tabulation methods. Such uniformity during preparation has not been the case. Since the survey was first fielded, improvements have been made to increase the reliability of the statistics and to make the survey results more useful. To that end, existing practices have been changed and new procedures have been instituted. Preservation of the comparability of the statistics has been an important consideration when improvements have been made, however. Changes to survey definitions, the industry classification system, and the procedure used to assign industry codes to multiestablishment companies[16] have had some, though not substantial, effects on the comparability of statistics.[17] The aspect of the survey that had a greater effect on comparability was the selection of samples at irregular intervals (i.e., 1967, 1971, 1976, 1981, 1987, 1992) and the use of a subset or panel of the last sample drawn to develop statistics for intervening years. As discussed earlier, this practice introduced cyclical deterioration of the statistics.

As compensation for this deterioration, periodic revisions have been made to the statistics produced from the panels surveyed between sample years. Early in the survey's history, various methods were used to make these revisions.[18] After 1976 and until 1992 with the advent of annual sampling, a linking procedure called wedging was used.[19] Simply described, in wedging, the two sample years on each end of a series of estimates serve as benchmarks in the algorithms used to adjust the estimates for the intervening years.

WEDGING METHODOLOGY

For a full discussion of the mathematical algorithm used for the wedging process that linked statistics from the 1992 survey with those from the 1987 survey, see the technical memorandum cited below.[20] In general, the memorandum states that wedging–

> *takes full advantage of the fact that in the first year of a new panel [when a new sample is selected], both current-year and prior-year estimates are derived. Thus, two independent estimates exist for the prior year. The estimates from the new panel are treated as superior primarily because the new panel is based on updated classifications [the industry classifications in the prior panel are frozen] and is more fully representative of the current universe (the prior panel suffers from panel deterioration, especially a lack of birth updating). The limitations in the prior panel caused by these factors are naturally assumed to increase with time, so that in the revised series, we desire a gradual increase in the level or revision over time which culminates in the real difference observed between the two independent sample estimates of the prior year. At the same time, we desire that*

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[15] Annual sampling also remedies the cyclical deterioration of the statistics that results from changes in a company's payroll composition because of product line and corporate structural changes.

[16] For discussions of each of these, see the Bureau of the Census technical memorandum entitled Wedging Considerations for the 1992 Research and Development (R&D) Survey, June 10, 1994.

[17] See the Bureau of the Census technical memoranda entitled Reclassification of Companies in the 1992 Survey of Industrial Research and Development (R&D) for the Generation of the Analytical Series, Oct. 25, 1994, and Effects of the 1987 SIC Revision on Company Classification in the Survey of Industrial Research and Development (R&D), Dec. 6, 1993.

[18] See U.S. Department of Commerce, Bureau of the Census, *Survey Design of the Survey of Industrial Research and Development: A Historical Perspective* (Washington, DC, 1995).

[19] The process was dubbed wedging because of the wedgelike area produced on a graph that compares originally reported statistics with the revised statistics that result after linking.

[20] Bureau of the Census technical memorandum, Wedging Considerations for the 1992 Research and Development (R&D) Survey, June 10, 1994.

the annual movement of the original series be preserved to the degree possible in the revised series.

To that end, the wedging algorithm does not change estimates from sample years and adjusts estimates from panel years, recognizing that deterioration of the panel is progressive over time.

WEDGED VERSUS NOT-WEDGED STATISTICS

One of the primary reasons for the decision to select a new sample annually rather than at irregular intervals was to avoid applying global revision processes such as wedging. Consequently, the 1992 survey was intended to be the last one to employ the wedging procedure.

REVISIONS TO HISTORICAL STATISTICS

Throughout the history of the survey, during regular survey processing, all immediate prior-year statistics have been subject to revision with results from the current year's survey. Changes to older statistics usually have been limited to revisions because of changes in the industry classification of companies caused by changes in payroll composition detected when a new sample was drawn. Various methodologies have been adopted over the years to revise, or backcast, the data when revisions to historical statistics have become necessary.

Documented revisions to the historical statistics from post-1967 surveys are summarized in *Research and Development in Industry: 1991* (NSF 94-325). Detailed descriptions of the specific revisions made to the statistics from pre-1967 surveys are scarce. However, summaries of some of the major revisions are included in the technical paper cited below.[21]

COMPARISONS TO OTHER STATISTICAL SERIES

The National Science Foundation (NSF) collects data on federally financed R&D from both Federal funding agencies and performers of the work (industry, Federal labs, universities, and other nonprofit organizations). As reported by Federal agencies, NSF publishes data on Federal R&D budget authority and outlays, in addition to Federal obligations. These terms are defined below:[22]

- *Budget authority* is the primary source of legal authorization to enter into financial obligations that will result in outlays. Budget authority most commonly is granted in the form of appropriations laws enacted by Congress with the approval of the President.[23]
- *Obligations* represent the amounts for orders placed, contracts awarded, services received, and similar transactions during a given period, regardless of when the funds were appropriated or when future payment of money is required.
- *Outlays* represent the amounts for checks issued and cash payments made during a given period, regardless of when the funds were appropriated or obligated.

For the reasons cited above, national R&D expenditure totals in NSF's *National Patterns of R&D Resources* report series are constructed primarily based on data reported by performers and include estimates of Federal R&D funding to these sectors. But until performer-reported survey data on Federal R&D expenditures are available from industry and academia, data collected from the Federal agency funders of R&D are used to project R&D performance. When survey data from the performers subsequently are tabulated (as they are in this report), these statistics replace the projections based on funder expectations. Historically, the two survey systems have tracked fairly closely. For example, in 1980 performers reported using $29.5 billion in Federal R&D funding, and Federal agencies reported total R&D funding between $29.2 billion in outlays and $29.8 billion in obligations.[24] In recent years, however, the two series have diverged considerably. For 1994, performers reported $60.2 billion in Federal R&D support, compared with the $66.2 billion to $68.3 billion reported by Federal agencies.[25]

The difference in the Federal R&D totals appears to be concentrated in funding of industry (primarily aircraft and missile firms) by the Department of Defense. Overall, industrial firms have reported significant declines in Federal R&D support since 1990 (see Table A-1), while Federal agencies reported level or slightly increased funding of industrial R&D. For 1994, Federal agencies reported $31.7 billion in total R&D obligations provided to industrial performers, compared with an estimated $22.5 billion in Federal R&D funding reported by industrial performers.[26] NSF is examining the causal factors of these divergent trends.

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[21] U.S. Department of Commerce, Burear of the Census, *Survey Design of the Survey of Industrial Research and Development: A Historical Perspective* (Washington, DC, 1995).

[22] See also NSF, *Federal Funds for Research and Development: Fiscal Years 1994–96*, NSF 97-302 (Arlington, VA, 1997).

[23] See NSF, *Federal R&D Funding by Budget Function: Fiscal Years 1994–96 (Budget Function)*, NSF 95-342 (Arlington, VA, 1995).

[24] NSF, *National Patterns of R&D Resources: 1996*, NSF 96-333 (Arlington, VA, 1996).

[25] Ibid.

[26] Ibid.

SURVEY DEFINITIONS

COST PER R&D SCIENTIST OR ENGINEER

The arithmetic mean of the numbers of full-time equivalent (FTE) scientists and engineers engaged in the performance of R&D reported for January in two consecutive years divided into the total R&D expenditures of the earlier year, with the ratio attributed to the earlier year. For example, the mean of the numbers of FTE R&D scientists and engineers in January 1993 and January 1994 is divided into total 1993 R&D expenditures for a total cost per R&D scientist or engineer in 1993.

EMPLOYMENT, FTE R&D SCIENTISTS AND ENGINEERS

Persons employed by the company during the January following the survey year who are engaged in scientific or engineering work at a level that requires knowledge of physical, life, engineering, or mathematical science equivalent at least to that acquired through completion of a 4-year college program with a major in one of those fields. The statistics in this report show the FTE employment. FTE employment is the number of scientists and engineers in the company who are assigned full time plus a prorated number employees working part-time on R&D.

EMPLOYMENT, TOTAL

Number of persons domestically employed by R&D-performing companies in all activities during the pay period that includes the 12th of March.

FEDERALLY FUNDED R&D CENTERS (FFRDCS)

R&D-performing organizations administered by industrial, educational, or other institutions on a non-profit basis, exclusively or substantially financed by the Federal Government. R&D expenditures of the FFRDCs that are industry administered are included with the Federal R&D data of the industry classification of each of the administering firms. The industry-administered FFRDCs included in the 1994 survey are listed as follows.

FFRDCS SUPPORTED BY THE DEPARTMENT OF ENERGY:

Bettis Atomic Power Laboratory
Westinghouse Electric Corp.
West Mifflin, PA

Energy Technology Engineering Center
Rockwell International Corp.
Canoga Park, CA

Hanford Engineering Development Laboratory
Westinghouse-Hanford Corp.
Richland, WA

Idaho National Engineering Laboratory
EG&G Idaho, Inc.;
Westinghouse Electric Corp.
Argonne National Laboratory, West;
Rockwell International Corp.;
Idaho Falls, ID

Knolls Atomic Power Laboratory
General Electric Co.
Schenectady, NY

Oak Ridge National Laboratory
Martin Marietta Energy Systems, Inc.
Oak Ridge, TN

Sandia National Laboratories
Western Electric Co., Inc.–Sandia Corp.
Albuquerque, NM

Savannah River Laboratory
Westinghouse Electric Corp.
Aiken, SC

FFRDC SUPPORTED BY THE DEPARTMENT OF HEALTH AND HUMAN SERVICES, NATIONAL INSTITUTES OF HEALTH:

NCI Frederick Cancer Research Facility
Program Resources, Inc.
Frederick, MD

FUNDS FOR R&D, COMPANY (AND OTHER)

Cost of R&D actually performed within the company and funded by the company itself or by other non-Federal sources by contract, not including the cost of R&D supported by companies but contracted to outside organizations such as research institutions, universities and colleges, nonprofit organizations, or (to avoid double-counting) other companies.

FUNDS FOR R&D, FEDERAL

Receipts for R&D performed by the company under Federal R&D contracts or subcontracts and R&D portions of Federal procurement contracts and subcontracts.

FUNDS FOR R&D, TOTAL

Operating expenses incurred by a company in the conduct of R&D in its own laboratories or other company-owned or -operated facilities including wages and salaries, materials and supplies, property and other taxes, maintenance and repairs, depreciation, and an appropriate share of overhead, not including capital expenditures.

NET SALES AND RECEIPTS

Dollar values for goods sold or services rendered by R&D-performing companies to customers (outside the company), including the Federal Government, less such items as returns, allowances, freight, charges, and excise taxes. Domestic intracompany transfers and sales by foreign subsidiaries are excluded, but transfers to foreign subsidiaries and export sales to foreign companies are included.

RESEARCH AND DEVELOPMENT

Basic and applied research in the sciences and engineering and the design and development of prototypes and processes, excluding quality control, routine product testing, market research, sales promotion, sales service, other nontechnological activities or routine technical services, and research in the social sciences or psychology.

BASIC RESEARCH

Original investigations for the advancement of scientific knowledge not having specific immediate commercial objectives, although such investigations may be in fields of present or potential interest to the reporting company.

APPLIED RESEARCH

Investigations for the discovery of new scientific knowledge having specific commercial objectives with respect to products or processes. (Applied research differs from basic research chiefly in terms of the objectives of the reporting company.)

DEVELOPMENT

Technical activities not routine in nature concerned with translating research findings or other scientific knowledge into products or processes. Not included are routine technical services to customers or other activities excluded above.

Documents

Section *Page*

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Bureau of the Census Cover Letter 118

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Form RD-1A Instructions 129

NATIONAL SCIENCE FOUNDATION
4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

OFFICE OF THE DIRECTOR

FROM THE DIRECTOR
NATIONAL SCIENCE FOUNDATION

The National Science Foundation requests your company's participation in its 1994 Survey of Industrial Research and Development. This annual survey is the only source of detailed information on U.S. industry's research and development (R&D) performance.

Your company's participation is vital to the accuracy of the resulting information. Because R&D expenditures are concentrated in relatively few companies, a completed response is needed from each surveyed firm – there is no good substitute for the information that you can provide. Your company can be assured of complete confidentiality. Survey data will be released only in aggregate form so that responses of individual companies cannot be identified.

Survey results will be made available to government and industry officials, researchers, and other interested individuals. If you have questions concerning the operation of this survey, please direct them to the Census Bureau's Environment, Technology, and Innovation Branch on (301) 457–1339. If you would like to receive a copy of the final publication or if you need to speak with someone at NSF, please call Jennifer Gray in the Division of Science Resources Studies on (703) 306–1772.

Sincerely,

Neal Lane

Neal Lane
Director

Enclosures

RD-1-L7 (1-95)

RD-1C-L1
(1-95)

UNITED STATES DEPARTMENT OF COMMERCE
Bureau of the Census
Washington, DC 20233-0001

OFFICE OF THE DIRECTOR

FROM THE DIRECTOR
BUREAU OF THE CENSUS

We have enclosed your company's report form and instructions for the 1994 "Survey of Industrial Research and Development." **Please review the instructions, complete the form, and return it within 60 days.** Federal law requires your responses to four items identified on the form. Your voluntary responses to all other items are needed to assure useful results. This survey can help your business and trade association plan new products and markets, and assist public officials in research funding and tax decisions that affect your industry.

We also ask that you keep track of the total time it takes to complete the survey form and the percent used for: (1) reading the instruction manual, (2) collecting the necessary information, and (3) completing the survey form. Please enter this information in the remarks section on the back of the report form.

Information you report should cover all your company's domestic operations for calendar year 1994. We recognize that providing this information is a burden and we have worked hard to minimize it. For example, if you do not have book records for any item, **you may provide carefully prepared estimates.** The law that authorizes this survey (Title 13, United States Code) requires that we keep your report in full confidence. Only sworn Census Bureau employees will see your information and they will use it only for statistical purposes.

We conduct this survey with National Science Foundation (NSF) support. We have enclosed a letter from the Director of the NSF emphasizing the importance and usefulness of the survey. If you have any questions, please contact my staff on (301) 457–1339. Thank you in advance for your cooperation.

Martha Farnsworth Riche

Martha Farnsworth Riche

Sincerely,

Enclosures

PLEASE RETURN BY: ☐

OMB No. 3145-0027: Approval Expires 12/31/95

NOTICE – Your report to the Census Bureau is **confidential** by law (Title 13, U.S. Code). It may be seen only by sworn Census employees and may be used only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

RETURN TO

Bureau of the Census
1201 East 10th Street
Jeffersonville, IN 47132-0001

Name of person who supplied 1993 data

Data supplied in items 1A and 1B and in item 3A, line 3, columns 4 and 6, for 1994 on this form will satisfy the mandatory reporting requirements. (Title 13, U.S. Code.)

PLEASE READ ENCLOSED INSTRUCTIONS BEFORE COMPLETING THIS FORM.

CENSUS USE ONLY

SURVEY CODE
4001

INDUSTRY CODE

WEIGHT

STATE

ADDRESS

SIC CODE

FORM **RD-1(S)**
(8-18-94)

U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS
COLLECTING AND COMPILING AGENT FOR
THE NATIONAL SCIENCE FOUNDATION

SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1994

In correspondence pertaining to this report refer to this **CENSUS FILE NUMBER (11 digits)** ▶

(Please correct any error in name and address including ZIP Code.)

GENERAL INSTRUCTIONS

Please complete this form and return within 60 days in the envelope provided. Make a copy for your records.

THIS REPORT SHOULD COVER YOUR ENTIRE COMPANY, INCLUDING ALL SUBSIDIARIES.

- The phrase **performed within the company** includes the activities of domestic subsidiaries.
- The phrase **foreign subsidiaries** is defined as those subsidiaries located outside of the 50 States and the District of Columbia.

Enter 0 (zero) where appropriate rather than leaving an item blank.

Figures for 1993 are those reported by your company last year. THE FIGURES SHOULD BE REVISED, IF NECESSARY, TO BE COMPARABLE TO 1994 DATA.

Explain any substantial increase or decrease in 1994 figures over 1993 in the "Remarks" section on the back page.

Please report figures in thousands of dollars. Reasonably accurate estimates are acceptable.

Section I - GENERAL COMPANY DATA

▶ Item 1 - SALES AND EMPLOYMENT FOR THE COMPANY

	Domestic net sales and receipts of this company *(Report in thousands of dollars)* 1993 Bil. | Mil. | Thou	1994 Bil. | Mil. | Thou
A. Domestic net sales and receipts of this company INCLUDE sales of products and services to other companies, individuals, U.S. Government agencies, and foreign countries. EXCLUDE domestic intra-company transfers and sales by foreign subsidiaries.	101	102
	1993 Number	**1994** Number
B. Total domestic company employment in all activities during the pay period which includes the 12th of March 1994 (Item 1 of I.R.S. Form 941, if one Form 941 was filed for the entire company.)	111	112

▶ Item 2 - NUMBER OF RESEARCH AND DEVELOPMENT SCIENTISTS AND ENGINEERS

Apportion on a full-time equivalent basis. *See page 4 of the instruction booklet for more detail*	**January 1994** Number	**January 1995** Number
A. TOTAL	201	202

▶ Item 3 - REPORT COSTS INCURRED FOR RESEARCH AND DEVELOPMENT

(Report in thousands of dollars)

	1993 Federal funds (1)	Company and other (2)	Total ((1)+(2)) (3)	**1994** Federal funds (4)	Company and other (5)	Total ((4)+(5)) (6)
	Bil. | Mil. | Thou	Bil. | Mil. | Thou	Bil. | Mil. | Thou	Bil. | Mil. | Thou	Bil. | Mil. | Thou	Bil. | Mil. | Thou
A. Within the company **1.** Basic research – *If "NONE," please mark (X) here and enter 0 (zero) where appropriate* → ☐	301	302	303	304	305	306
2. Applied research and development – **a.** Applied research	311	312	313	314	315	316
b. Development	321	322	323	324	325	326
c. Total – *Sum of lines a and b*	331	332	333	334	335	336
3. Total – *Sum of lines 1 and 2.c*	341	342	343	344	345	346
B. Outside the company – Total company funds for research and development activities financed by the company but performed by others outside the company within the United States *(Should be excluded from 3.A.3. above)*		352			355	
C. Foreign – Total company funds for research and development activities performed by foreign subsidiaries or by other organizations outside the United States *(Should be excluded from 3.A.3. and 3.B. above)*		362			365	
D. TOTAL – Company and other funds, except Federal – *Sum of lines 3.A.3., 3.B., and 3.C* →		372			375	

▶ Item 4 - COMPANY AND OTHER FUNDS, EXCEPT FEDERAL, FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BUDGETED FOR THE YEAR 1995

	1995 Bil. | Mil. | Thou
(Comparable to the 1994 figure reported in item 3.A.3., column (5).)	401

Section II - RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE DOMESTIC COMPANY

▶ Item 5 - ENERGY RESEARCH AND DEVELOPMENT PERFORMED WITHIN THIS COMPANY

- Report expenditures for energy research development by type of energy sources. Include the project cost or portion of project cost incurred for the purpose of increasing energy resources or capabilities. These expenditures should be included in item 3.A., line 3, columns (4) and (6).
- Estimate expenditures for energy research by energy source for 1995.

(Report in thousands of dollars)

	Key code	**1993** Federal funds (1)	Total funds (2)	**1994** Federal funds (1)	Total funds (2)	**1995** Projected Federal funds (3)	Projected total funds (4)
	10	Bil. | Mil. | Thou	Bil. | Mil. | Thou	Bil. | Mil. | Thou	Bil. | Mil. | Thou	Bil. | Mil. | Thou	Bil. | Mil. | Thou
A. Total nuclear	03						
B. Total fossil fuels	12						
C. Total geothermal, solar, conservation and utilization	16						
D. All other energy	17						
E. TOTAL – *Sum of lines A through D* →	18						

PLEASE CONTINUE ON REVERSE SIDE

☐

Item 6 - POLLUTION ABATEMENT RESEARCH AND DEVELOPMENT PERFORMED WITHIN THIS COMPANY

- Report expenditures for pollution abatement by the form of pollution to be abated. Include the project cost or portion of the project cost incurred for the purpose of designing pollution abatement products or product characteristics or of designing pollution abatement features into processes. These expenditures should be included in item 3.A., line 3, columns (4) and (6).
- Estimate expenditures for pollution abatement research for 1995.

		(Report in thousands of dollars)					
		1993		1994		1995	
	Key code	Federal funds (1)	Total funds (2)	Federal funds (1)	Total funds (2)	Projected Federal funds (3)	Projected total funds (4)
	11	Bil. Mil. Thou.	Bil. Mil. Thou.	Bil. Mil. Thou.	Bil. Mil. Thou.	Bil. Mil. Thou.	Bil. Mil. Thou
A. TOTAL ——————→	08						

Item 7 - COVERAGE AND OPERATIONAL STATUS

A. Are research and development expenditures for entire domestic company, including subsidiaries, reported on this form?

1301 ☐ Yes
1302 ☐ No - *Please explain in the "Remarks" section on the back of the page.*

B. Was this company owned or controlled by another company on December 31, 1994?

1303 ☐ Yes - *Complete 13.C.* 601 Date acquired: Month ____ Year ____
1304 ☐ No

C. New owner information

602 Name

603 Address *(Number and street)*

604 City | 605 State | 606 ZIP Code

Item 8 - CERTIFICATION - This report is substantially accurate and has been prepared in accordance with instructions

Name of person to contact regarding this report | Telephone: Area code | Number | Extension

Signature of authorized official | Title | 701 Date

801 REMARKS

FORM **RD-1-S(I)**
(11-7-94)

U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS
COLLECTING AND COMPILING AGENT FOR
THE NATIONAL SCIENCE FOUNDATION
WASHINGTON, DC 20233

INSTRUCTIONS FOR SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1994

FORM RD-1(S)

OUTLINE OF INSTRUCTIONS

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GENERAL INSTRUCTIONS

INTRODUCTION – Comprehensive and timely information about the nature and support of corporate research and development (R&D) activities is an important component in the overall assessment of our nation's scientific and technological resources. The information you provide is used to prepare national measures of industrial research and development (R&D) not available from any other source. By carefully completing this report, the accuracy of this information is ensured.

SURVEY SCOPE – This report covers both public and privately-owned nonfarm business firms in all sectors of the United States Economy. It does not include operations owned by Federal, State or local governments, or nonprofit organizations.

If your company is a nonprofit organization, please indicate so in the remarks section, page 2, and return the form.

If this form has been directed to a trust or pension plan which performs no activity other than investments, do not report. Please note in remarks section, page 2, and return the form.

REPORTING ENTITY – Report R&D for all domestic operations of your company, including subsidiaries and divisions. Report for all parts of the company that are located in the 50 states and the District of Columbia. Report sales and employment figures for all parts of the company, even those that do not perform R&D, as long as they are located in the 50 states or the District of Columbia.

If this form has been directed to a holding company, report for all subsidiaries and operations under the ownership and control of the holding company.

Companies Reporting in Survey for the First Time – Companies which did not report in the 1993 survey are asked to provide figures for both 1993 and 1994. If the company had no R&D expenditures, complete only Item 1. Enter "No R&D" in the "Remarks" section, sign, and return the form.

Figures for Earlier Years Are Preposted on the Form – If your company reported for 1993, entries from that form have been copied on the present form. Please describe in the "Remarks" section (page 2 of the form) the reasons for any substantial increase or decrease in the 1994 figures entered on this form when compared to corresponding 1993 figures. Examples of such reasons are new government contracts, acquisitions and divestitures, revised accounting method, etc.

If you acquired or disposed of a unit performing an important amount of R&D during the 2-year period, please identify the unit in "Remarks," and give the total amount of R&D accounted for by such unit.

Revision of Earlier Year Figures – If your company reported for 1993, entries from that form are pre-printed on the current form. Please revise the 1993 figures to be comparable with 1994 data and explain in the "Remarks" section any significant revisions made.

ESTIMATES ARE ACCEPTABLE – If you cannot answer a question from your company records, please estimate the answer carefully.

HOW TO REPORT – Report all value figures in thousands of dollars.

Example: 1,123,678,599 dollars.

	Bil.	Mil.	Thou.	Dol.
Report	$1	123	679	000

If you estimate your answers in millions of dollars, please fill the thousands box with zeros.

Example: 1,124 million dollars.

	Bil.	Mil.	Thou.	Dol.
Report	$1	124	000	000

PERIOD COVERED BY THE REPORT – Figures should be reported on a calendar year basis. Fiscal year data are acceptable for all items except for employment, provided your fiscal year ends between September and March. Please report employment figures (Items 1B and 2) for the specific time indicated for both of these items. Enter "0" where appropriate rather than leaving a blank space.

ADDITIONAL FORMS – Photocopies of this form are acceptable. If you require additional forms, write to the Bureau of the Census, 1201 East 10th Street, Jeffersonville, IN 47132-0001 or call (812) 288–3331.

FILING EXTENSIONS – If you cannot complete the survey in 60 days, request an extension of time by writing to the address below (please include your Census File Number):

Bureau of the Census
1201 East 10th Street
Jeffersonville, IN 47132-0001

or call: (812) 288–3331.

ALTERNATIVE REPORTING FORMATS – For information concerning use of reporting formats other than the form provided, such as computer tape, diskette, or printouts, contact Ronanne M. Capps or Nancy Higgins on (301) 457–1339.

BURDEN HOUR ESTIMATE – Public reporting burden for this collection of information is estimated to average 20 hours per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimates or any other aspects of this collection of information including suggestions for reducing this burden to Herman G. Fleming, National Science Foundation, 4201 Wilson Boulevard, Arlington, VA 22230; and to the Office of Information and Regulatory Affairs, Office of Management and Budget (OMB No. 3145-0027), Washington, DC 20503.

DIRECT QUESTIONS regarding this form to the Bureau of the Census, ATTN: Manufacturing and Construction Division, Washington, DC 20233-0001 or call (301) 457–1339.

DEFINITION OF RESEARCH AND DEVELOPMENT – R&D includes basic research and applied research in the sciences and in engineering, and design and development of prototype products and processes.

For the purposes of this study, R&D includes activities carried on by persons trained, either formally or by experience, in the physical sciences including related engineering, and the biological sciences including medicine but excluding psychology, if the purpose of such activity is to do one or more of the following things:

1. Pursue a planned search for new knowledge, whether or not the search has reference to a specific application.
2. Apply existing knowledge to problems involved in the creation of a new product or process, including work required to evaluate possible uses.
3. Apply existing knowledge to problems involved in the improvement of a present product or process.

Research and development includes the activities described above whether assigned to separate R&D organizational units of the company or carried out by company laboratories and technical groups not part of an R&D organization. Reporting the R&D activities of such latter groups may require the use of estimates for some of the questions.

Activities to be excluded from R&D:

- Routine product testing
- Research in social sciences or psychology
- Geological and geophysical exploration activities
- Technical services such as:
  - Quality and quantity control
  - Technical plant sanitation control
  - Trouble-shooting in connection with breakdowns in full-scale production
  - Advertising programs to promote or demonstrate new products or processes
  - Assistance in preparation of speeches and publications for persons not engaged in R&D
- Social Science R&D - Social Science R&D is defined to encompass those activities devoted to further understanding the behavior of groups of human beings or of individuals as members of groups. Some of the topics include the following:
  - Personnel R&D
  - Economic R&D
  - Artificial intelligence and expert systems R&D
  - Consumer, market, and opinion R&D
  - Engineering psychology R&D
  - Management and organization R&D
  - Actuarial and demographic R&D
  - Educational processes and applications R&D
  - R&D in law

SPECIFIC INSTRUCTIONS

▶ Section 1 – GENERAL COMPANY DATA

Item 1 – SALES AND EMPLOYMENT FOR THE COMPANY

Item 1A – Domestic Net Sales and Receipts

Sales and receipts are defined as the revenue for goods produced, distributed, or services provided. Include revenue from investments, rents, and royalties only if it is the principal business of the company. The reported figures should represent net value f.o.b. plant after discount and allowances and should exclude freight charges and excise taxes.

Include:

- All operating receipts from taxable operations, as well as total revenue from tax-exempt activities
- Sales of products and services to other companies, individuals, U.S. Government agencies, and foreign countries
- Transfers to foreign subsidiaries

Exclude:

- Domestic intra-company transfers
- Sales by foreign subsidiaries

Item 1B – Domestic Employment

Report the number of employees of the company in all activities in the 50 states and the District of Columbia during the pay period which includes March 12, 1994. This figure would be the same as Item 1 of Treasury Form 941, if one Form 941 was filed for the entire company. Report number of employees, not payroll.

Item 2 – NUMBER OF RESEARCH AND DEVELOPMENT SCIENTISTS AND ENGINEERS

Scientists and engineers are defined for this survey as all persons engaged in scientific or engineering work at a level which requires a knowledge of physical or life sciences or engineering or mathematics equivalent to completion of a 4-year college course with a major in these fields, regardless of whether or not they actually hold a degree in this field.

The figure on R&D scientists and engineers will be obtained primarily from two sources:

1. For company laboratories performing only R&D, report the number of scientists and engineers on the rolls in January.
2. For employees whose activities are not solely devoted to R&D, report the proportion of their time that is devoted to R&D. For example, if a company had the full-time equivalent of 60 scientists and engineers in January 1995 and one-fourth of their time was charged to R&D projects, the figure for the number of R&D scientists and engineers for this company would be 15.

Item 3 – REPORT COSTS INCURRED FOR RESEARCH AND DEVELOPMENT

Include as costs:

- Wages, salaries, and related costs
- Materials and supplies consumed
- R&D depreciation
- Cost of computer software used in R&D activities
- Utilities, such as telephone, telex, electricity, water, and gas
- Travel costs and professional dues
- Property taxes and other taxes (except income taxes) incurred on account of the R&D organization or the facilities they use
- Insurance expenses
- Maintenance and repair, including maintenance of buildings and grounds
- Company overhead including: personnel, accounting, procurement and inventory, and salaries of research executives not on the payroll of the R&D organization

Exclude as costs:

- R&D performed abroad (outside the Continental U.S.), such as in Canada and Puerto Rico (Except in Item 3.C.)
- R&D performed by non-company R&D organizations of any kind (Except in Item 3.B.)
- Capital expenditures
- Patent expense
- Income taxes and interest
- The portion of company-held R&D contracts that were subcontracted outside the reporting company
- Fellowships, grants, and gifts to promote R&D or the study of science and engineering
- Social Science R&D

Item 3.A – Report Costs Incurred for Research and Development Performed Within the Company

Federally sponsored R&D performed within the company should reported in column 4.

Costs of company sponsored R&D performed within the company, or R&D performed within the company under contract from non-federal sources should be reported in column 5.

Costs of INDEPENDENT R&D should also be reported in column 5. For the purpose of this survey, INDEPENDENT R&D is defined as R&D performed by the company for which you anticipate reimbursement by the government through indirect charges for the purchase of products or services.

Types of Research

3.A.1 – Basic Research

Include the cost of research projects which represent original investigation for the advancement of scientific knowledge and which do not have specific immediate commercial objectives, (although they may be in the fields of present or potential interest to the reporting company).

Item 3.A.2.a – Applied Research

Include the cost of research projects which represent investigation in discovery of new scientific knowledge and which have specific commercial objectives with respect to either products or processes.

Item 3.A.2.b – Development

Include the cost of projects which represent technical activity concerned with non-routine problems encountered in translating research. Include the findings or other general scientific knowledge into products or process.

Include as development:

- The design and operation of pilot plants and semiwork plants
- Engineering activity required to advance the design of a product or process so it meets specific functional and economic requirements
- Design, construction, and testing of prototypes and models
- Designs for special manufacturing equipment and tools
- Preparation of reports, drawings, formulas, specifications, standard practice instructions, or operating manuals
- Software development

Exclude as development:

- Routine technical services to customers
- Toolmaking and tool tryout
- Production of detailed construction drawings and manufacturing blueprints
- Pre-production planning

ESTIMATING BASIC, APPLIED, AND DEVELOPMENT EXPENDITURES

If your company does not keep records that meet or can be allocated to these specific categories, estimate by:

- Isolating the projects that clearly fall in the development category. If your company fabricates products, such development activity will include the design, construction, and testing of prototypes and models. Some defense contracts typically call for several test models. If your company's R&D frequently involves the development of a "process" as in chemicals and petroleum, such development activity would include operations beyond the bench scale, primarily the design and operations of pilot plants or semiworks.

- Isolating the organizational units which have R&D activities that can be readily classified based on the function assigned to the unit. If R&D work is done in production units as well as in various laboratories, it is generally development type.

- Distributing the balance on the basis of individual projects or on the basis of other summaries of the work. Please use the definitions for basic, applied, and development given above.

Item 3.A.2.c – Total Costs for Applied Research and Development

Add line 3.A.2.a and line 3.A.2.b.

Item 3.A.3 – Total Costs for Basic and Applied Research and Development Performed Within the Company

Add line 3.A.1 and line 3.A.2.c.

Item 3.B – Total Costs Incurred for Research and Development Performed Outside the Company Within the United States and Financed by the Company

Report payments for R&D activities performed for the company in the form of contracts, grants, and fellowships made to other industrial firms, commercial laboratories, consultants, educational institutions, hospitals, and research institutions or other organizations.

Do not include subcontracting of R&D contracts received from the Federal Government or other companies.

Item 3.C – Total Costs Incurred for Research and Development Performed by Foreign Subsidiaries or by Other Organizations Outside of the United States and Financed by the Company

FOREIGN SUBSIDIARIES are those outside of the 50 States and the District of Columbia.

Report the amount of R&D financed by the U.S. parent or its foreign subsidiaries, including Canada and Puerto Rico, and performed by company R&D laboratories, branch plants, or other organizations, located outside the United States.

Exclude R&D activities performed by foreign subsidiaries which were financed by foreign governments or other organizations.

Item 3.D – Total-Company and Other Funds, Except Federal

With the exception of "Other funds," this number represents company sponsored R&D performed within the company. It is comparable to information reported on Form 10K if you report to the Securities and Exchange Commission.

To complete this item, add line 3.A.3, line 3.B, and line 3.C.

SOURCE OF FUNDS

Item 3 - FEDERAL FUNDS - (Columns 1+4)

Include:

- Amount of work done on Federal R&D contracts or subcontracts in the current year
- R&D portions of procurement contracts or subcontracts

Exclude:

- Federal R&D contracts and R&D portions of procurement contracts that you subcontracted to other R&D organizations (including these would cause duplication in the statistical totals, which include data on work actually performed by each company).
- If your company performs independent research and development (IR&D), please read the following carefully:
- Definition of IR&D - We define IR&D funds as expenditures that are reimbursable by the government for qualified projects that usually have potential interest to the Department of Defense or other agencies of the Federal government. These IR&D funds are not included in work done under a research contract with the government. They are reimbursed to the company through indirect charges to the government for the purchase of products or services.

HOW TO REPORT

Report expenditures for which you anticipate reimbursement as company funds in column 5. Report expenditures in the period for which they are incurred. Do not include the actual reimbursement.

Item 3 - COMPANY AND OTHER FUNDS

(Columns 2+5) Report all company-sponsored R&D performed within the company. Report R&D performed under contract from non-Federal sources.

Item 4 - COMPANY AND OTHER FUNDS, EXCEPT FEDERAL, FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BUDGETED FOR THE YEAR 1995

Report the estimated cost of company and other non-federally sponsored R&D that will be performed within the 50 states and the District of Columbia. This item is comparable to the 1994 figure reported in Item 3.A.3, column 5.

▶ Section II - RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE DOMESTIC COMPANY

Item 5 - ENERGY RESEARCH AND DEVELOPMENT

Include all spending for R&D to increase energy resources or capabilities, including the development of energy equipment. Energy R&D can include costs of R&D projects (both product and process) on exploration, extraction, transportation, processing, storage, generation (including conversion), distribution, conservation, etc., etc., of present, new, or improved forms of energy. Record energy R&D spending according to type of energy in Items 5A through 5E.

If R&D spending is for joint or multiple purposes, estimate and report the portion of cost incurred for the energy purpose. In the limited number of cases where the separation of joint (multiple) costs by type of energy cannot be estimate, include the total cost of the R&D project when the primary purpose of the project is energy R&D. If the project is not primarily for energy R&D then exclude all of the project cost.

Conservation and utilization includes R&D activities undertaken to reduce consumption either at the point of energy use or in the transmission, transportation, storage, and conversion of energy. Examples of such are R&D undertaken primarily to reduce fuel consumption in manufacturing, to improve the efficiency of transportation of energy products, or to produce an end product which is more efficient in energy consumption.

All Other Energy Includes areas such as wind, waste, hydroelectric, etc. Also include in this category the development of energy equipment which cannot be readily classified in Items 5A to 5C.

Item 6 - POLLUTION ABATEMENT RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY

Includes R&D spending for the purpose of reducing or eliminating the emission of pollutants. "Pollution" refers to the emission of pollutants to the outside of a firm's property or activities; "abatement" includes prevention, treatment, or recycling.

Exclude costs:

- to contribute to environmental aesthetics
- to increase equipment durability in corrosive environments
- to conserve energy (include as energy R&D in item 5C)
- to conserve natural resources
- to increase employee comfort, safety, and health

If the only purpose of the R&D spending is pollution abatement, include the total expenditures on the project. If pollution abatement is only one of several purposes, report only the R&D costs associated with pollution abatement. When the separation of joint costs is not feasible, include the total R&D costs for a project if the purpose is primarily (more than 50 percent) for pollution abatement.

If the project is not primarily for pollution abatement purposes, exclude all of the project costs. Also exclude project costs if expected pollution abatement benefits are obtained at no extra cost.

Item 7 - COVERAGE AND OPERATIONAL STATUS

Item 7A

Check the appropriate box if the domestic company expenditures on this form, including all subsidiaries, have R&D. If no, please explain in remarks section or in a transmittal letter.

Item 7B

Check the appropriate box if this company was owned or controlled by another company on December 31, 1994. If yes, provide date of the organizational change.

Item 7C

Provide the name and address of the new owner. In the "Remarks" section, specify change or correction, e.g., wholly-owned subsidiary of ABC Company", "merger with XYZ Company", "acquired by 123 Corporation".

Item 8 - CERTIFICATION

Report the name and telephone number of the person to contact regarding this report.

DUE DATE: 60 DAYS AFTER RECEIPT OF FORM

OMB No. 3145-0027: Approval Expires 12/31/9

NOTICE — Your report to the Census Bureau is **confidential** by law (title 13, U.S. Code).

FORM **RD-1A**
(10-13-94)

U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS

SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1994

In correspondence pertaining to this report refer to this **CENSUS FILE NUMBER (11 digits)** ▶

The instructions and definitions on this form are not complete. Please read the enclosed instruction sheet before completing this form.

RETURN TO

▼

BUREAU OF THE CENSUS
1201 East 10th Street
Jeffersonville, IN 47132-0001

Data supplied in item 1 and in item 3A.3, columns 1 and 3 for 1994 on this form will satisfy the mandatory reporting requirements (title 13, U.S. Code).

FROM THE DIRECTOR
BUREAU OF THE CENSUS

The Bureau of the Census conducts the "Survey of Industrial Research and Development" under the sponsorship of the National Science Foundation (NSF).

Enclosed are the 1994 survey form and instructions for completing it, and a letter from the NSF emphasizing the survey's prominence. The 1994 report covers your entire domestic company operations. We will appreciate your cooperation in reporting the requested information.

The law (title 13, United States Code) authorizes this report. Your response is mandatory for item 1 and item 3A.3, columns 1 and 3. We need your voluntary cooperation in reporting the remaining items to make the survey results comprehensive and accurate. We recognize you may not maintain book records for some items. In such cases, please provide carefully prepared estimates.

By section 9 of title 13, your report to the Bureau of the Census is confidential. Only sworn Bureau of the Census employees will see the information you reported, and they will use it only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

Please return the completed form within 60 days. If you have questions concerning the survey, need copies of the form, or need additional time, please call the survey office on (301) 763–2962. We thank you for your cooperation in this vital survey.

Sincerely,

Martha Farnsworth Riche

Martha Farnsworth Riche

Enclosures

IMPORTANT

The telephone number
to call for assistance
has been changed from
(301) 763-2962
to
(301) 457-1339

PLEASE OPEN AND BEGIN THE SURVEY WITH ITEM 1.

GENERAL INSTRUCTIONS

Please complete this form and return within 60 days in the envelope provided. Make a copy for your records. THIS REPORT SHOULD COVER YOUR ENTIRE COMPANY, INCLUDING ALL SUBSIDIARIES, UNLESS OTHERWISE DESIGNATED.

Enter 0 (zero) where appropriate rather than leaving a blank space.

Reasonably accurate estimates are acceptable.

If your company is a nonprofit organization, please indicate so in remarks section and return the form. If this form has been directed to a trust or pension plan which performs no activity other than investments, do not report. Please note in remarks and return the form.

Item 1 – SALES AND EMPLOYMENT FOR COMPANY

A. INCLUDE sales of products and services to other companies, individuals, U.S. Government agencies, and foreign countries from all domestic operations of your company.

Domestic sales and receipts of this company			
1994			
Bil.	Mil.	Thou.	Dol.
102 $			000

B. Total domestic company employment in all activities during the pay period which includes the 12th of March 1994. (Item 1 of I.R.S. Form 941, if one Form 941 was filed for the entire company.)

Domestic employment
1994
Number
112

RESEARCH AND DEVELOPMENT — R&D

Includes basic and applied research in the sciences and in engineering, and design and development of prototype products and processes.

For the purposes of this survey, research and development includes activities carried on by persons trained, either formally or by experience, in the physical sciences including related engineering, and the biological sciences including medicine but excluding psychology, if the purpose of such activity is to do one or more of the following things:

1. Pursue a planned search for new knowledge, whether or not the search has reference to a specific application. (Basic Research)
2. Apply existing knowledge to problems involved in the creation of a new product or process, including work required to evaluate possible uses. (Applied Research)
3. Apply existing knowledge to problems involved in the improvement of a present product or process. (Development)

Research and development includes the activities described above whether assigned to separate R&D organizational units of the company or carried out by company laboratories and technical groups not part of an R&D organization. Reporting the R&D activities of such latter groups may require the use of estimates for some of the questions.

See instructions for more detail.

Item 2 – CHECK FOR RESEARCH AND DEVELOPMENT

Mark (X) the appropriate box.

201 ☐ Company had R&D in 1994 – *Complete form, enter zeros where applicable, and return this form.*
202 ☐ Company had no R&D in 1994, but has in the past and may in the future – *Go to item 7, sign, and return this form.*
203 ☐ Company does not conduct R&D – *Go to item 7, sign, and return this form.*

Item 3 – REPORT COSTS INCURRED FOR RESEARCH AND DEVELOPMENT IN 1994

A. WITHIN THE COMPANY – Costs incurred for research and development performed within the company by major type and source of funds *(Should be excluded from B and C)*	Federal funds (1)				Company and other (2)				Total ((1) + (2)) (3)			
	Bil.	Mil.	Thou.	Dols.	Bil.	Mil.	Thou.	Dols.	Bil.	Mil.	Thou.	Dols.
1. Basic research *If "None," please mark (X)* → 300 ☐	304 $			000	305 $			000	306 $			000
2. Applied research and development **a.** Applied research	314 $			000	315 $			000	316 $			000
b. Development	324 $			000	325 $			000	326 $			000
c. Total *(Sum of lines a and b)* →	334 $			000	335 $			000	336 $			000
3. TOTAL *(Sum of 1 and 2c)* →	344 $			000	345 $			000	346 $			000
B. Outside the company – Total company funds for research and development activities financed by the company but performed by others outside the company within the United States *(Should be excluded from A3)*					355 $			000				
C. Foreign – Total company funds for research and development activities performed by foreign subsidiaries or by other organizations outside the United States *(Should be excluded from A3)*					365 $			000				
D. TOTAL – Company and other funds, except Federal *(This line represents company sponsored research and development with the exception of "other funds.") (Sum of A3 (column 2), B, and C)* →					375 $			000				

Item 4 – COMPANY AND OTHER FUNDS, EXCEPT FEDERAL FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BUDGETED FOR THE YEAR 1995	Bil.	Mil.	Thou.	Dols.
	401 $			000

Item 5 – NUMBER OF RESEARCH AND DEVELOPMENT SCIENTISTS AND ENGINEERS

Includes all persons engaged in scientific or engineering work at a level which requires a knowledge of physical or life sciences, engineering, or mathematics equivalent to completion of a 4-year college course of study with a major in these fields, regardless of whether or not they actually hold a degree in this field.

	January 1995
	Number
Report the full-time equivalent number of R&D scientists and engineers on the rolls in January 1995. For employees whose activities are not solely devoted to research and development, report the proportion of their time that is devoted to research and development. *(See instructions for examples)*	502

Item 6A – COVERAGE AND OPERATIONAL STATUS

Are research and development expenditures for entire domestic company, including subsidiaries reported on this form?

☐ Yes
☐ No – *Please explain in remarks or on transmittal letter.*

Was this company owned or controlled by another company on December 31, 1994?

☐ Yes – *Complete 6B.* Date acquired ——→
☐ No

Month	Year
601	

Item 6B – NEW OWNER OR OPERATOR

602 Name

603 Address

604 City

605 State

606 ZIP Code

CHECK ITEM Please complete the checks listed below BEFORE returning this questionnaire. By checking these items you will reduce the likelihood of our calling you to resolve an error or inconsistency.

	Yes	No
In item 1A:		
1. Sales is reported in **thousands** of dollars, NOT in millions or dollars	☐	☐
In item 1B:		
2. Your answer describes the number of **employees**, NOT company payroll ..	☐	☐
In item 3:		
3. Verify that **Federal funds** (column 1) plus **Company funds** (column 2) equals **Total funds** (column 3) for:		
a. Basic research (3A.1)	☐	☐
b. Applied research (3A.2a)	☐	☐
c. Development (3A.2b)	☐	☐
d. Total applied research and development (3A.2c)	☐	☐
e. Total costs within the company (3A.3)	☐	☐
4. Verify that **basic** research (3A.1) plus **applied** research and development (3A.2c) equals total funds spent within the company (3A.3)	☐	☐
5. Verify in **column 2** (Company and other), that total funds **within** the company (3A.3), plus funds spent outside the company (3B) and by **foreign** subsidiaries (3C), equals total funds spent (3D)	☐	☐

IF THE ANSWER TO ANY OF THE ABOVE CHECKS IS "NO", PLEASE MAKE THE NECESSARY CORRECTIONS IN THE APPROPRIATE ITEM(S) OR PROVIDE AN EXPLANATION IN THE REMARKS SECTION.

Item 7 – CERTIFICATION – This report is substantially accurate and has been prepared in accordance with instructions.

Name of person to contact regarding this report

Telephone ——→	Area code	Number	Extension

Signature of authorized official

Title

701 Date

801 REMARKS

FORM **RD-1A(I)**
(11-1-94)

U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS

INSTRUCTIONS AND DEFINITIONS FOR SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1994
FORM RD-1A

GENERAL INSTRUCTIONS

Please complete and return this form in the envelope provided within 60 days. Make a copy for your records.

INTRODUCTION – Comprehensive and timely information about the nature and support of corporate research and development (R&D) activities is an important component in the overall assessment of our nation's scientific and technological resources. The information you provide is used to prepare national measures of industrial R&D not available from any other source. By carefully completing this report, the accuracy of this information is ensured.

SURVEY SCOPE – This report covers both public and privately-owned nonfarm business firms in all sectors of the United States economy. It does not include operations owned by Federal, State or local governments, or nonprofit organizations.

If your company is a nonprofit organization, please indicate so in the remarks section, page 4, and return the form.

If this form has been directed to a trust or pension plan which performs no activity other than investments, do not report. Please note in remarks section, page 4, and return the form.

REPORTING ENTITY – Report R&D for all domestic operations of your company, including subsidiaries and divisions. Report for all parts of the company that are located in the 50 States and the District of Columbia. Report sales and employment figures for all parts of the company, even those that do not perform R&D, as long as they are located in the 50 States or the District of Columbia.

If this form has been directed to a holding company, report for all subsidiaries and operations under the ownership and control of the holding company.

ESTIMATES ARE ACCEPTABLE – If you cannot answer a question from your company records, please estimate the answer carefully.

HOW TO REPORT – Report all value figures in thousands of dollars.

Example: 1,123,678,599 dollars.

	Bil.	Mil.	Thou.	Dol.
Report	$1	123	679	000

If you estimate your answers in millions of dollars, please fill the thousands box with zeros.

Example: 1,124 million dollars.

	Bil.	Mil.	Thou.	Dol.
Report	$1	124	000	000

Enter "0" where appropriate rather than leaving a blank space.

PERIOD COVERED BY THE REPORT – Figures should be reported on a calendar year basis. Fiscal year data are acceptable for all items except for employment, provided your fiscal year ends between September and March. Please report employment figures (Items 1B and 5) for the specific time indicated for both of these items.

ADDITIONAL FORMS – Photocopies of this form are acceptable. If you require additional forms, write to the Bureau of the Census, 1201 East 10th Street, Jeffersonville, IN 47132-0001 or call (812) 288-3331.

FILING EXTENSIONS – If you cannot complete the survey in 60 days, request an extension of time by writing to the address below (please include your Census File Number):

Bureau of the Census
1201 East 10th Street
Jeffersonville, IN 47132-0001

or call: (812) 288–3331.

BURDEN HOUR ESTIMATE – Public reporting burden for this collection of information is estimated to average 1 hour per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimates or any other aspects of this collection of information including suggestions for reducing this burden to Herman G. Fleming, National Science Foundation, 4201 Wilson Boulevard, Arlington, VA 22230; and to the Office of Information and Regulatory Affairs, Office of Management and Budget (OMB No. 3145-0027), Washington, DC 20503.

Direct any **QUESTIONS** regarding this form to the Bureau of the Census, ATTN: Manufacturing and Construction Division, Washington, DC 20233-0001, or call (301) 457–1339.

DEFINITION OF RESEARCH AND DEVELOPMENT – R&D includes basic research and applied research in the sciences and in engineering, and design and development of prototype products and processes.

For the purposes of this study, R&D includes activities carried on by persons trained, either formally or by experience, in the physical sciences including related engineering, and the biological sciences including medicine but excluding psychology, if the purpose of such activity is to do one or more of the following things:

1. Pursue a planned search for new knowledge, whether or not the search has reference to a specific application.

2. Apply existing knowledge to problems involved in the creation of a new product or process, including work required to evaluate possible uses.

3. Apply existing knowledge to problems involved in the improvement of a present product or process.

Research and development includes the activities described above whether assigned to separate R&D organizational units of the company or carried out by company laboratories and technical groups not part of an R&D organization. Reporting the R&D activities of such latter groups may require the use of estimates for some of the questions.

Activities to be excluded from R&D:

- Research in social sciences or psychology
- Routine product testing
- Geological and geophysical exploration activities
- Technical services such as:
  - Quality and quantity control
  - Technical plant sanitation control
  - Trouble-shooting in connection with breakdowns in full-scale production
  - Advertising programs to promote or demonstrate new products or processes
  - Assistance in preparation of speeches and publications for persons not engaged in research and development.
- Social Science R&D – Social Science R&D is defined to encompass those activities devoted to further understanding the behavior of groups of human beings or of individuals as members of groups. Some of the topics include the following:
  - Personnel R&D
  - Economic R&D
  - Artificial intelligence and expert systems R&D
  - Consumer, market, and opinion R&D
  - Engineering psychology R&D
  - Management and organization R&D
  - Actuarial and demographic R&D
  - Educational processes and applications R&D
  - R&D in law

SPECIFIC INSTRUCTIONS

Item 1 – SALES AND EMPLOYMENT FOR THE COMPANY

Item 1A – Domestic Sales and Receipts

Sales and receipts are defined as the revenue for goods produced, distributed, or services provided. Include revenue from investments, rents, and royalties only if it is the principal business of the company. The reported figures should represent net value f.o.b. plant after discount and allowances and should exclude freight charges and excise taxes.

Include:

- All operating receipts from taxable operations, as well as total revenue from tax-exempt activities
- Sales of products and services to other companies, individuals, U.S. Government agencies, and foreign countries
- Transfers to foreign subsidiaries

Exclude:

- Domestic intra-company transfers
- Sales by foreign subsidiaries

Item 1B – Domestic Employment

Report the number of employees of the company in all activities in the 50 States and the District of Columbia during the pay period which includes March 12, 1993. This figure would be the same as Item 1 of Treasury Form 941, if one Form 941 was filed for the entire company. Report number of employees, not payroll.

Item 2 – CHECK FOR RESEARCH AND DEVELOPMENT

Check the box that best describes the R&D activities of your company.

Item 3 – REPORT COSTS INCURRED FOR RESEARCH AND DEVELOPMENT

Include as costs:

- Wages, salaries, and related costs
- Materials and supplies consumed
- R&D depreciation
- Cost of computer software used in R&D activities
- Total charges for work done on contract, including profit
- Utilities, such as telephone, telex, electricity, water, and gas
- Travel costs and professional dues
- Property taxes and other taxes (except income taxes) incurred on account of the R&D organization or the facilities they use
- Insurance expenses
- Maintenance and repair, including maintenance of buildings and grounds
- Company overhead including: personnel, accounting, procurement and inventory, and salaries of research executives not on the payroll of the R&D organization

Exclude as cost:

- R&D performed abroad (outside the Continental U.S.), such as in Canada and Puerto Rico (Except in Item 3.C.)
- R&D performed by non-company R&D organizations of any kind (Except in Item 3.B.)
- Capital expenditures
- Patent expense
- Income taxes and interest
- The portion of company-held R&D contracts that were subcontracted outside the reporting company
- Fellowships, grants, and gifts to promote R&D or the study of science and engineering
- Social Science R&D

Item 3.A – Report Costs Incurred for Research and Development Performed Within the Company

Federally sponsored R&D performed within the company should be reported in column 1.

Costs of company sponsored R&D performed within the company, or R&D performed within the company under contract from non-federal sources should be reported in column 2.

Costs of INDEPENDENT R&D should also be reported in column 2. For the purpose of this survey, INDEPENDENT R&D is defined as R&D performed by the company for which you anticipate reimbursement by the government through indirect charges for the purchase of products or services.

TYPES OF RESEARCH

Item 3.A.1 – Basic Research

Include the cost of research projects which represent original investigation for the advancement of scientific knowledge and which do not have specific immediate commercial objectives (although they may be in the fields of present or potential interest to the reporting company).

Item 3.A.2.a – Applied Research

Include the cost of research projects which represent investigation in discovery of new scientific knowledge and which have specific commercial objectives with respect to either products or processes.

Item 3.A.2.b – Development

Include the cost of projects which represent technical activity concerned with non-routine problems encountered in translating research findings or other general scientific knowledge into products or process.

Include as development:

- The design and operation of pilot plants and semiwork plants
- Engineering activity required to advance the design of a product or process so it meets specific functional and economic requirements
- Design, construction, and testing of prototypes and models
- Designs for special manufacturing equipment and tools
- Preparation of reports, drawings, formulas, specifications, standard practice instructions, or operating manuals
- Software developement

Exclude as development:

- Routing technical services to customers
- Toolmaking and tool tryout
- Production of detailed construction drawings and manufacturing blueprints
- Pre-production planning

ESTIMATING BASIC, APPLIED, AND DEVELOPMENT EXPENDITURES

If your company does not keep records that meet or can be allocated to these specific categories, estimate by:

- Isolating the projects that clearly fall in the development category. If your company fabricates products, such development activity will include the design, construction, and testing of prototypes and models. Some defense contracts typically call for several test models. If your company's R&D frequently involves the development of a "process" as in chemicals and petroleum, such development activity would include operations beyond the bench scale, primarily the design and operations of pilot plants or semiworks.
- Isolating the organizational units which have R&D activities that can be readily classified based on the function assigned to the unit. If R&D work is done in production units as well as in various laboratories, it is generally development type.
- Distributing the balance on the basis of individual projects or on the basis of other summaries of the work. Please use the definitions for basic, applied, and development given above.

Item 3.A.2.c – Total Costs for Applied Research and Development

Add line 3.A.2.a and line 3.A.2.b.

Item 3.A.3 – Total Costs for Basic and Applied Research and Development Performed Within the Company

Add line 3.A.1 and line 3.A.2.c.

Item 3.B – Total Costs Incurred for Research and Development Performed Outside the Company Within the United States and Financed by the Company

Report payments in the form of contracts, grants, and fellowships made to other industrial firms, commercial laboratories, consultants, educational institutions, hospitals, and research institutions or other organizations for R&D activities performed for the company.

Do not include subcontracting of R&D contracts received from the Federal Government or other companies.

Item 3.C – Total Costs Incurred for Research and Development Performed by Foreign Subsidiaries or by Other Organizations Outside of the United States and Financed by the Company

FOREIGN SUBSIDIARIES are those outside of the 50 States and the District of Columbia.

Report the amount of R&D financed by the U.S. parent or its foreign subsidiaries, including Canada and Puerto Rico, and performed by company R&D laboratories, branch plants, or other organizations, located outside the United States. Report R&D activities of foreign divisions and subsidiaries in Item 3.C only.

Exclude R&D activities performed by foreign subsidiaries which were financed by foreign governments or other outside organizations

Item 3.D – Total – Company and Other Funds, Except Federal

With the exception of "Other funds," this number represents company sponsored R&D performed within the company. It is comparable to information reported on Form 10K if you report to the Securities and Exchange Commission.

To complete this item, add line 3.A.3, line 3.B and line 3.C.

SOURCE OF FUNDS

Item 3 – FEDERAL FUNDS (Column 1)

Include:

- Amount of work done on Federal R&D contracts or subcontracts in the current year
- R&D portions of procurement contracts or subcontracts

Exclude:

Federal R&D contracts and R&D portions of procurement contracts that you subcontracted to other R&D organizations (including these would cause duplication in the statistical totals, which include data on work actually performed by each company).

If your company performs independent research and development (IR&D), please read the following carefully:

Definition of IR&D – We define IR&D funds as expenditures that are reimbursable by the government for qualified projects that usually have potential interest to the Department of Defense or other agencies of the Federal government. These IR&D funds are not included in work done under a research contract with the government. They are reimbursed to the company through indirect charges to the government for the purchase of products or services.

HOW TO REPORT – Report expenditures for which you anticipate reimbursement as company funds in column 2. Report expenditures in the period for which they are incurred. Do not include the actual reimbursement.

Item 3 – COMPANY AND OTHER FUNDS (Column 2)

Report all company-sponsored R&D performed within the company. Report R&D performed under contract from non-Federal sources.

Item 4 – COMPANY AND OTHER FUNDS, EXCEPT FEDERAL, FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BUDGETED FOR THE YEAR 1994

Report the estimated cost of company and other non-federally sponsored R&D that will be performed within the 50 States and the District of Columbia. This item is comparable to the 1993 figure reported in item 3.A.3, column 2.

Item 5 – NUMBER OF RESEARCH AND DEVELOPMENT SCIENTISTS AND ENGINEERS

Scientists and engineers are defined for this survey as all persons engaged in scientific or engineering work at a level which requires a knowledge of physical or life sciences or engineering or mathematics equivalent to completion of a 4-year college course with a major in these fields, regardless of whether or not they actually hold a degree in this field.

The figure on R&D scientists and engineers will be obtained primarily from two sources:

1. For company laboratories performing only R&D, report the number of scientists and engineers on the rolls in January.
2. For employees whose activities are not solely devoted to R&D, report the proportion of their time that is devoted to R&D. For example, if a company had the full-time equivalent of 60 scientists and engineers in January 1995 and one-fourth of their time was charged to R&D projects, the figure for the number of R&D scientists and engineers for this company would be 15.

Item 6A – Coverage and Operational Status

Indicate if this form includes R&D expenditures for entire domestic company, including subsidiaries. Indicate if this company was owned or controlled by another company on December 31, 1994.

Item 6B – New Owner or Operator

Report the date the company was acquired and the new owner's name and address information.

CHECK ITEM

Mark "Yes" or "No" as appropriate for each of the checks in this item. If the answer to any of the checks is "No", provide an explanation in the remarks section.

Item 7 – CERTIFICATION

Report the name and telephone number of the person to contact regarding this report.

The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants for research and education in the sciences, mathematics and engineering.

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